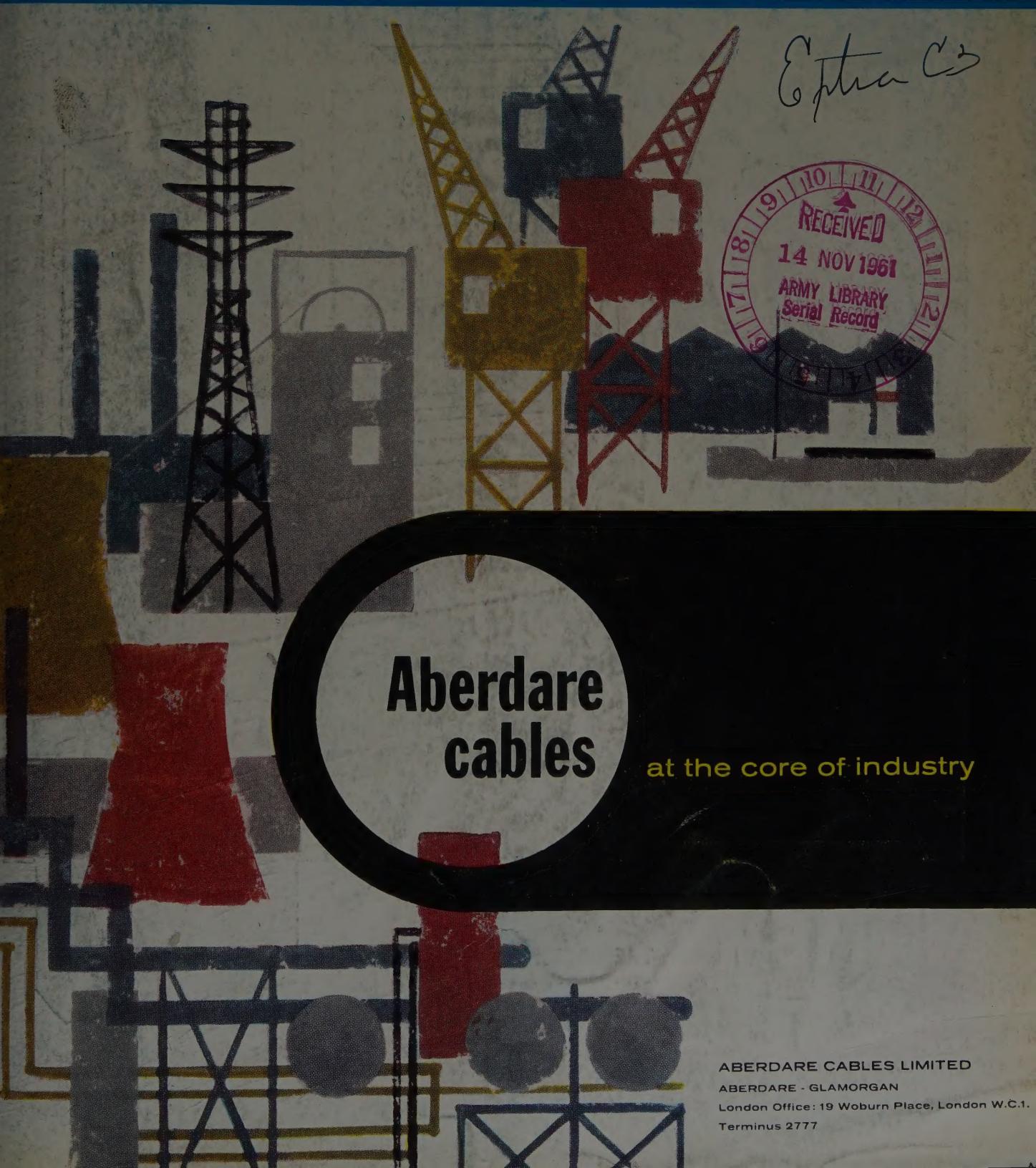


ELECTRICAL REVIEW

FRIDAY
OCTOBER 1961

WEEKLY
PRICE 1s 6d



Aberdare
cables

at the core of industry

ABERDARE CABLES LIMITED

ABERDARE - GLAMORGAN

London Office: 19 Woburn Place, London W.C.1.

Terminus 2777

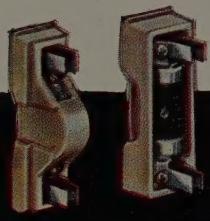
The "EXEL" Range of Switchgear

Complies with B.S. 2510: 1954

RATINGS: 15-30-60-100 AMPS**500 VOLTS A.C. or D.C.**

Fuses are of the new 'Kantark-Exel' pattern which will accept semi-enclosed rewirable or H.R.C. Fuses.

Semi-enclosed rewirable (damper type) patterns comply with B.S. 3036: 1958.



H.R.C. cartridge patterns, which are interchangeable with the semi-enclosed rewirable patterns, comply with B.S.88. 1952.

M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links to B.S.88.1952, Appendix 'J' Dimensions, Form A-Offset Tags.

All live metal is adequately shielded to avoid accidental contact when cover is open. The porcelain shields also serve as efficient arc barriers.

Wiring space is generous. A detachable switchbar facilitates wiring.

All units are arranged for internal fixing. Keyhole slots are provided at top. There are no external lugs.

The 'Exel' range ensures compliance with the most strict interpretation of I.E.E. Regulations (13th Edition), and with the requirements of The Electricity (Factories Act) Special Regulations.

Modern buildings demand switchgear of sound technical performance and compliance with the latest relevant British Standards, and that is in harmony with the most modern surroundings. The 'Exel' range of switchgear will meet all these requirements.

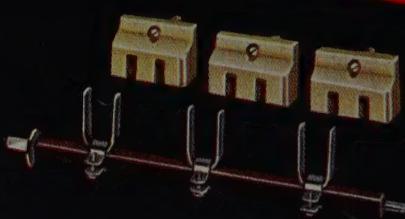
Fabricated cases are of heavy gauge sheet steel with hinged covers, rust-proofed and finished grey stove enamel. Chrome plated front operating switch handles.

Removable endplates are provided at top and bottom of case with semi-pierced knockouts which, on removal, provide clearance holes for conduit.



The hinged covers are detachable in order to facilitate wiring or to preserve finish.

Gaskets are fitted to all covers, rendering the switchgear enclosures dust and weather proof.



**THE GREATEST SAFEGUARD
AN INSTALLATION CAN HAVE**

Write for catalogue No. 450 R

MIDLAND ELECTRIC MANUFACTURING CO. LTD., REDDINGS LANE, TYSELEY, BIRMINGHAM 11
(Members of B.E.A.M.A. for twenty-three years)

MEM

BACKGROUND HEATING ON A BUDGET BASIS



Sleekline

FLOOR MODELS
4 ft, 3 ft and 2 ft

DECENTRALISED
ELECTRIC
HEATING UNITS

with Personal Heat Control

OFF LOW MEDIUM HIGH



Here is the central heating system that can be installed in any home, new or old, with little or no installation costs—and it's a system that can be added to from time to time as required. What is more it can be removed from home to home.



WALL MOUNTING UNITS

4 ft, 3 ft and 2 ft

The simple fixing of wall mounted units enables them to be removed in a few seconds when re-decorating or spring cleaning. They can be installed with room-thermostat control.

Write for Leaflet No. 103

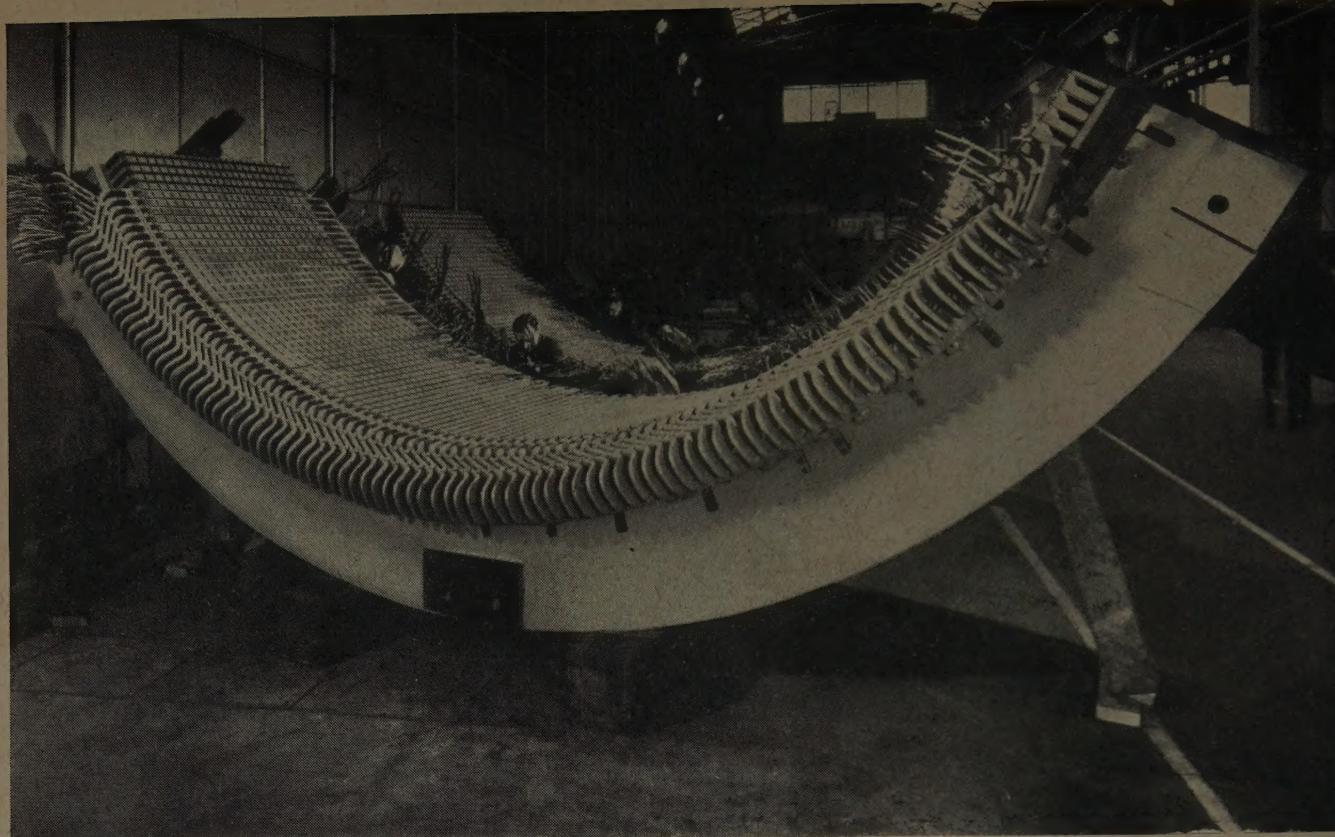
LOADINGS

4 ft. . . . 800 watts
3 ft. . . . 600 watts
2 ft. . . . 400 watts

HEATRAE LTD.

NORWICH • NORFOLK • NOR 29A • ENGLAND

Telephone: Norwich 28193 (Private Exch.) Telegrams: HEATRAE, NORWICH



A Segment of a 46,000 kVA Stator during winding. Photograph by permission of The English Electric Co. Ltd.

IOCO *Insulation* nearly 50 years of progress

We congratulate BEAMA on their Jubilee with particular cordiality; our own 50th anniversary as electrical insulation manufacturers follows closely.

During half a century IOCO LIMITED have pioneered many of the materials which are to-day accepted universally. We now manufacture S.R.B. Laminates and Flexible Insulation in a range of qualities to meet the great majority of specifications. Insulation Engineers with special problems or special requirements are invited to make use of our Insulation Advisory Service.



IOCO LIMITED

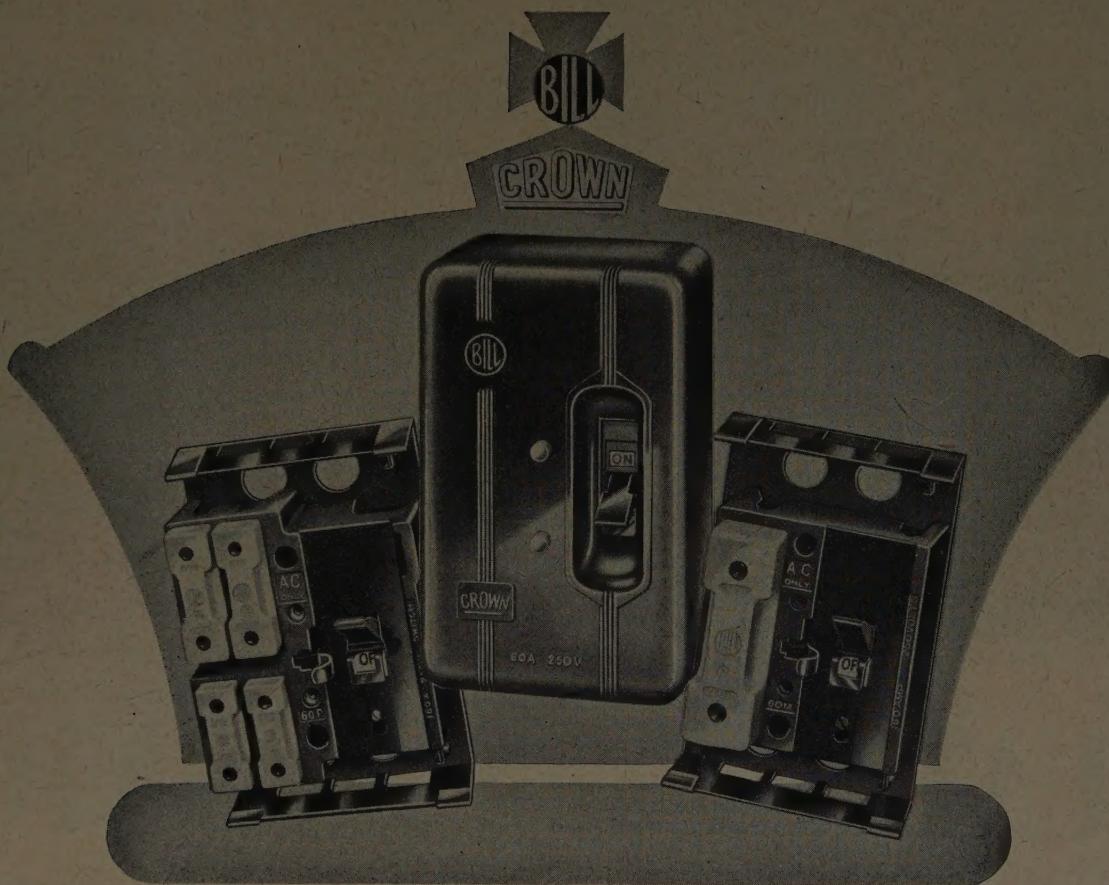
Netherton Works, Anniesland, Glasgow, W.3
Telephone: Scotstoun 5501

ONE OF THE VICKERS GROUP OF COMPANIES





You cannot buy better gear



SWITCHFUSES AND SWITCH SPLITTERS NEW PRICES

- A RANGE OF S.P. & N. MAIN SWITCHGEAR FOR MODERN DOMESTIC INSTALLATIONS.
- AVAILABLE IN 15, 21, 30, 34 AND 60 AMP. SWITCH RATINGS.
- SAFE AND RELIABLE SLOW-BREAK A.C. FRONT OPERATED SWITCHES.
- ALL-INSULATED OR METAL CASES—FULLY INTERLOCKED FOR SAFETY.
- VITREOUS PORCELAIN FUSES IN H.R.C. OR  ARC DAMPING TYPE.

ASK FOR ILLUSTRATED PRICE LIST No. CR.761

PRICE LIST PL.561 OR NEW CATALOGUE G.561 NOW AVAILABLE

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
BIRMINGHAM · 20



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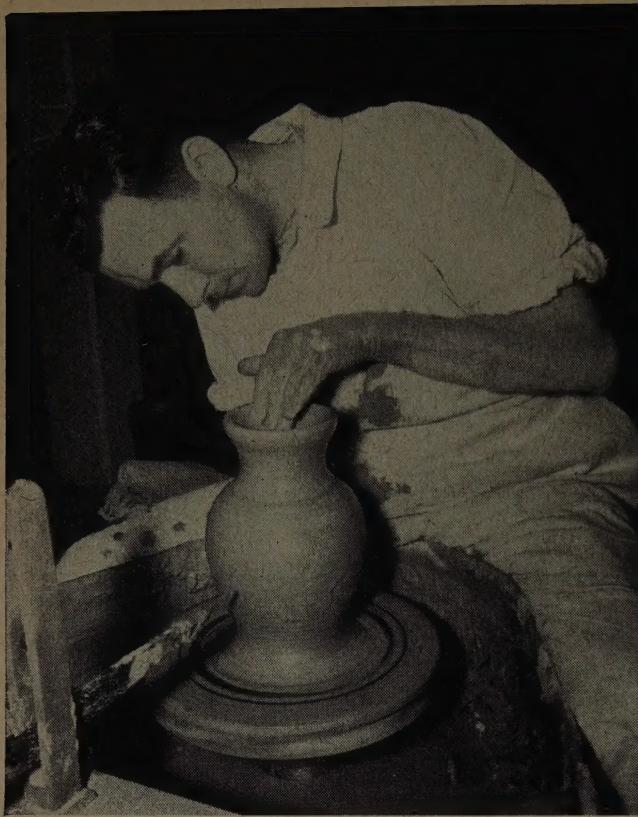
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Quality in Craftsmanship, Potter

(Photo Fox Photos Ltd)

QUALITY and SERVICE

CRYSELCO BRANCHES

are situated throughout the country.

Their aim is to give you quality products plus good service.

CRYSELCO Managers in the following towns and cities would be pleased to hear from you.

BEDFORD
BIRMINGHAM
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SOUTHAMPTON



CRYSELCO LIMITED

KEMPSTON WORKS **BEDFORD**

BEDFORD

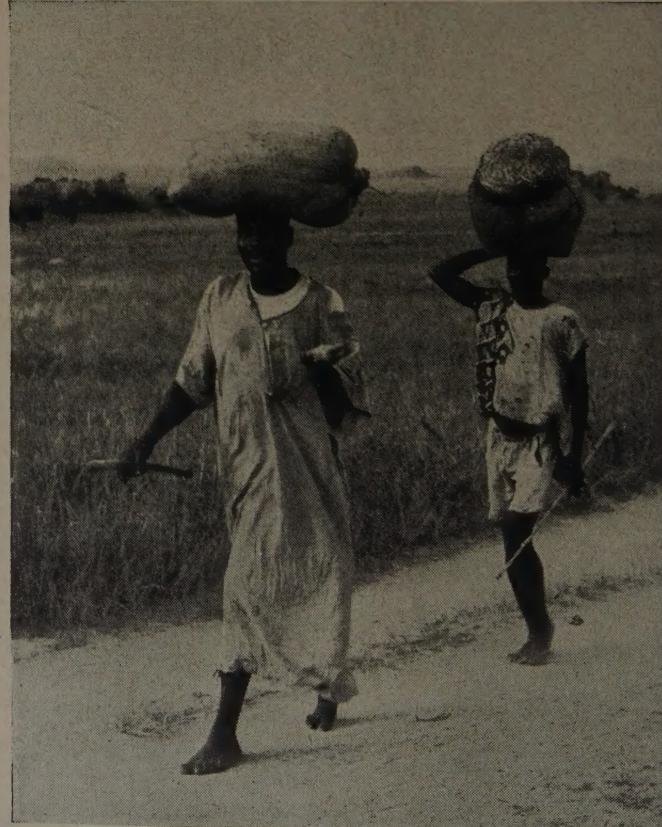
CRYSELCO

lamps and fittings can be obtained from any of fourteen branches and depots throughout the country.

All CRYSELCO business is based upon a policy of Quality and Service.

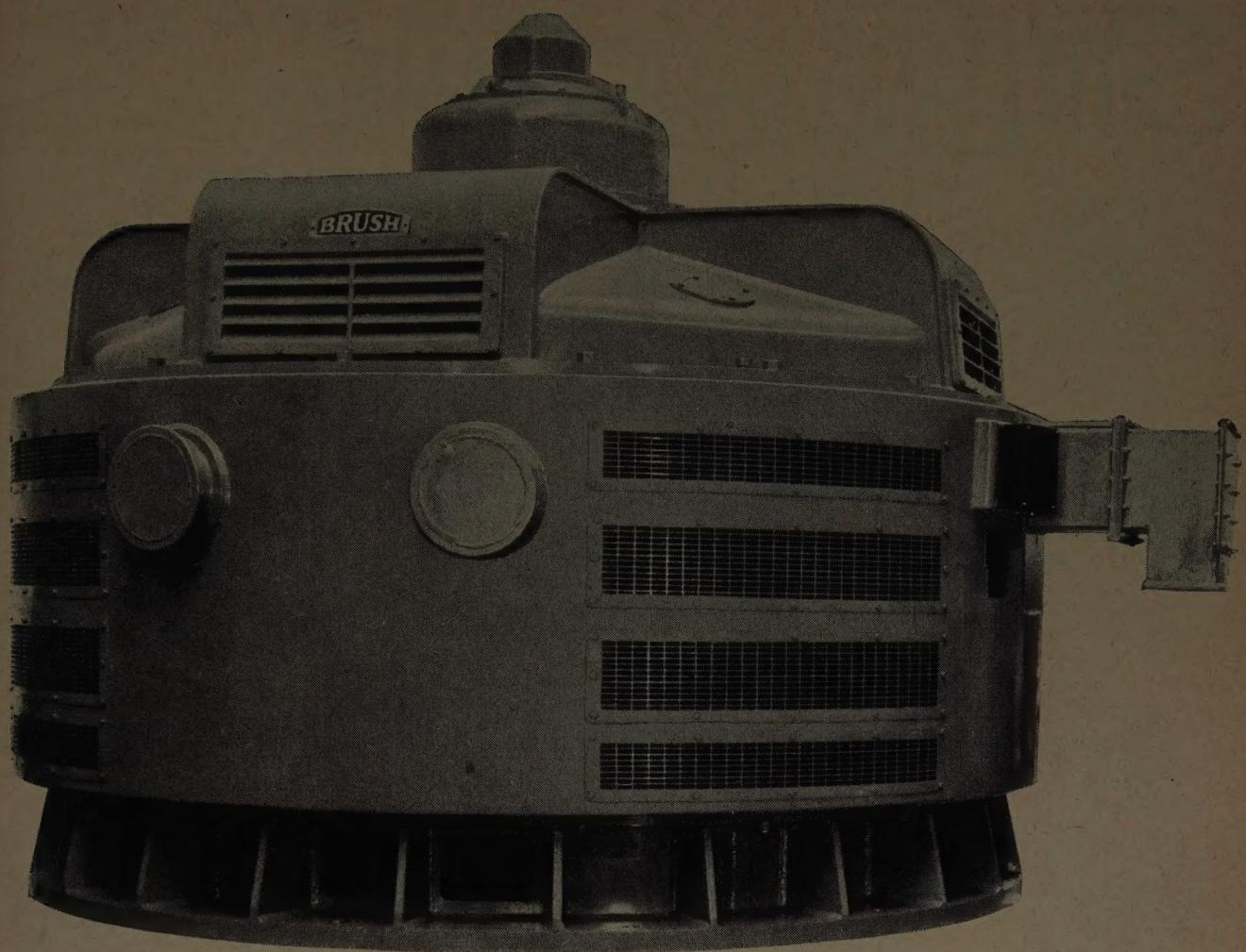
This attention to detail in production and distribution, coupled with more than 60 years' experience in lamp manufacture, ensures quality products, promptly delivered.

The range of lamps and fittings available is extensive. If you have not received the current catalogue, please send for one today.



Service by Bearer, Nigeria

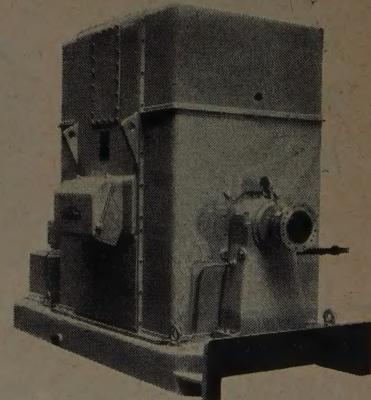
(Photo J. Allan Cash)



Brush motor designed for pump drive with very heavy down-thrust loading

Exhaustive endurance tests have proved the outstanding reliability of these Brush Water Pump Driving Motors.

For boiler feed and water circulation pumps, I.D. and F.D. fan and other auxiliary driving motors—specify Brush.



Boiler House feed water pump drive motor.

BRUSH

ROTATING MACHINES

For further details apply to:

BRUSH ELECTRICAL ENGINEERING CO. LTD. · LOUGHBOROUGH · ENGLAND

A Member of
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E.4

STILL! NO OTHER LAMP HAS ALL ITS FEATURES

—including the popular price



By Appointment to
Her Majesty the Queen
Manufacturers of
Electric Lamps.

YOU KNOW WHAT THESE FEATURES OF 'LIFE-LIGHT' ARE: LONG LIFE, FULL LIGHT OUTPUT; RESISTANCE TO SHOCK; LOW CURRENT CONSUMPTION, THEY CAN BE USED ANY WAY UP; A PATENT SHATTER-PROOF FUSE. YOU KNOW WHY 'LIFE-LIGHT' LAMPS ARE BETTER—THE FULL STORY IS IN THE COUNTER LEAFLET.

And no other lamp has this new and successful advertising

Last year, you remember, we did something entirely new in lamp advertising. We didn't use gimmicks or slogans but explained exactly *why* 'Life-light' was a better lamp. This campaign caused more comment than any lamp advertising for years and we are going on with the same theme because it is the kind of advertising that is cumulative, but we are doing far more of it. In all, these advertisements will be seen over 80 million times. So this year they will do even more to increase your sales.

Crompton LIFE-LIGHT

To help you sell these lamps hard we are offering you this point-of-sale and display material. Use it. See your customers buy the lamp that sheds a bright light on your good name.



1. MOBILE. This well balanced and attractive mobile can be used in the window or in the shop.

2. LARGE DISPLAY. This forms the centre piece of a window display or alternatively can be used as a large showcard inside the shop.

3. SHOWCARD. Carries on the 'Life-light' theme. Attractive and striking to look at and takes up very little space. Use on the counter to attract attention.

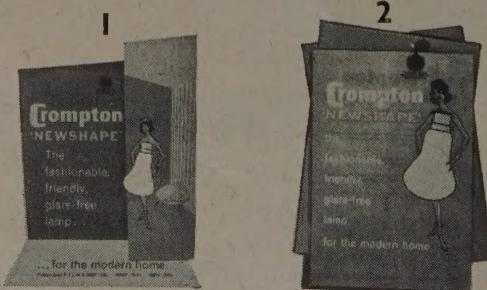
4. LEAFLETS. These leaflets are your best aid to selling 'Life-light'. They tell the customer exactly why 'Life-light' is a better lamp. They mean repeat buying so see that they are picked up.

ALSO THIS YEAR:- Sales material for the
CROMPTON 'NEWSHAPE' LAMP

1. SHOWCARD. Clean, bright and attractive. Use it to draw attention to this very popular lamp.

2. LEAFLETS. Keep them near showcard; they are powerful selling aids.

Note. Crompton 'Newshape' has the same internal construction as 'Life-light': It is thus as much in advance of other lamps with this new bulb as 'Life-light' is in advance of other lamps of the ordinary shape.



DISPENSER

This compact floor dispenser which is 61 in. high and only 13 in. square is a valuable sales aid for use inside your shop.

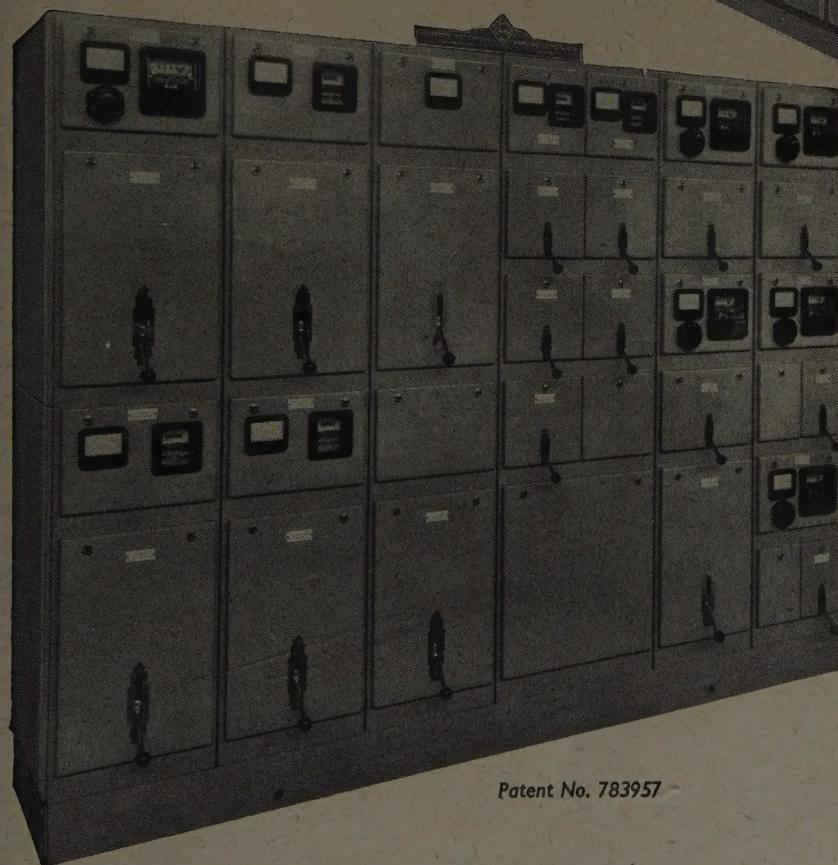
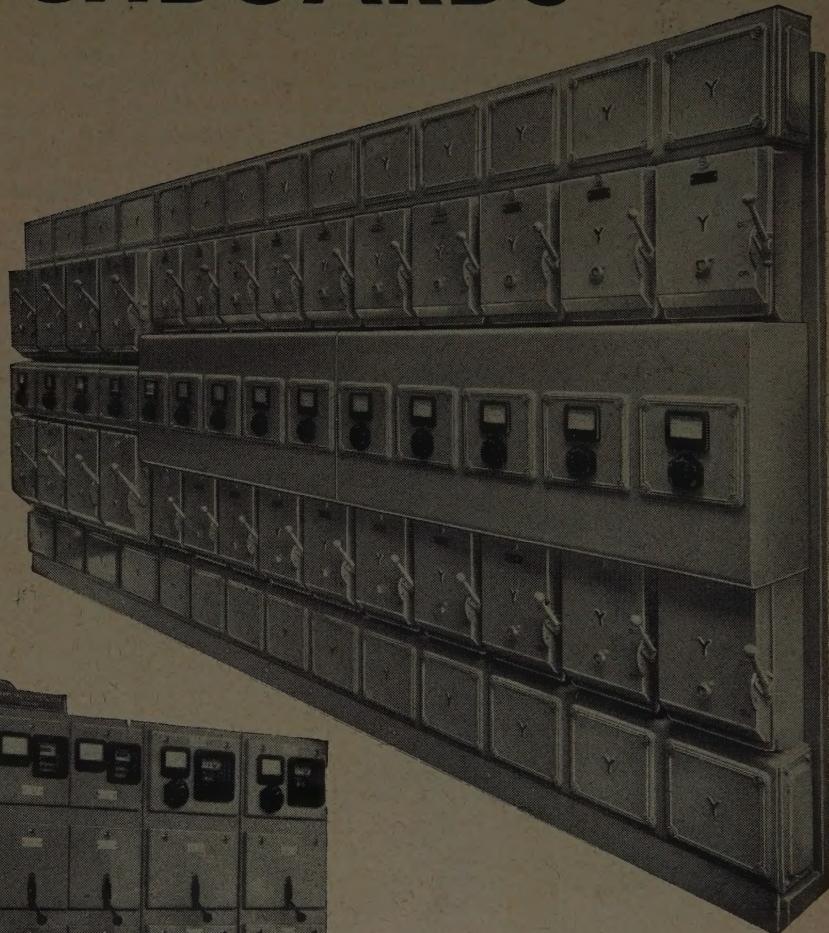


CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2.

UNIT AND CUBICLE CONSTRUCTION SWITCHBOARDS

Illustration on right shows an indoor totally enclosed unit construction type "Y" switchboard with incoming duplicate busbars feeding common outgoing circuits by means of interlocked fused switches of both 300 amp and 500 amp capacity.

Illustration below shows an indoor all-isolating cubicle construction switchboard having individual metering on the outgoing fused switches of 60 amp, 160 amp and 300 amp capacity.



Patent No. 783957

We specialise in building switchboards to your exact requirements with facilities for extension. Designed to give unfailing service under the most onerous climatic conditions whether installed indoors or out of doors.

ELECTRO MECHANICAL MFG. CO. LTD.

Head Office and Works : Eastfield, SCARBOROUGH

Telephone : Cayton Bay 441/2

London Office and Showroom : 133-135 Grand Buildings, Trafalgar Square, LONDON, W.C.2

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Subsidiary of Yorkshire Switchgear and Eng. Co. Ltd., Leeds

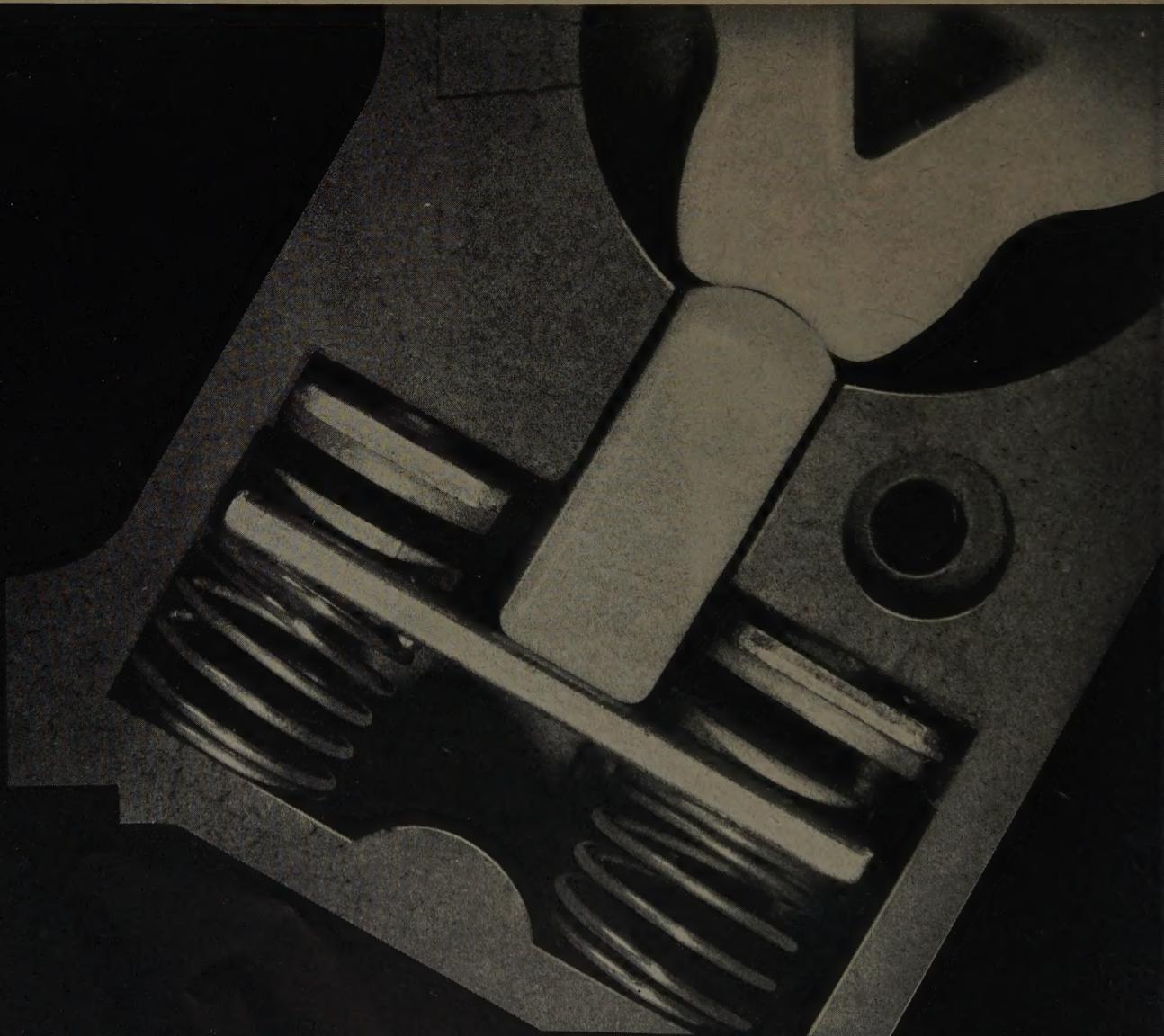
'HIDUTAC' switchfuses break 8 times their rated full load current

This high breaking capacity is made possible by cam-operated, silver contact, double-break "interruptor" units—just one of many 'Hidutac' exclusive features resulting from the *new approach* of the G.E.C. Installation Equipment Group to switchgear design. The *new approach* has crystallised from G.E.C.'s many years' experience of making switchgear superbly well.

Consider these other impressive advantages: *Unlimited full load switching*—'Hidutac' switchfuses operate at their full load current with unfailing reliability. *A unique compactness*, brought about by radial positioning of contacts. Generous wiring space and easy access to terminals at the front. *Total internal enclosure* of all moving parts, with shields over live terminals. *High fault current protection* in Single Pole and Neutral, Double Pole, Triple Pole and Neutral switchfuses with H.R.C. or rewirable fuses. Categories of duty are: H.R.C. fuses, all ratings, AC4 of BS88 (33000 amp); rewirable fuses, 15 and 30 amp ratings, S2A of BS3036 (2000 amp); rewirable fuses, 60 amp rating, S4A of BS3036 (4000 amp). *Modern styling* of pressed steel case with fully interlocked cover.

These exclusive features make 'Hidutac' switchfuses vastly superior for tungsten and discharge lighting control, motor control, and transformer and capacitor switching.

IMMEDIATE DELIVERY of 'Hidutac' switchfuses from wholesalers throughout the country. For more detailed information ask your wholesaler for 'Hidutac' literature.



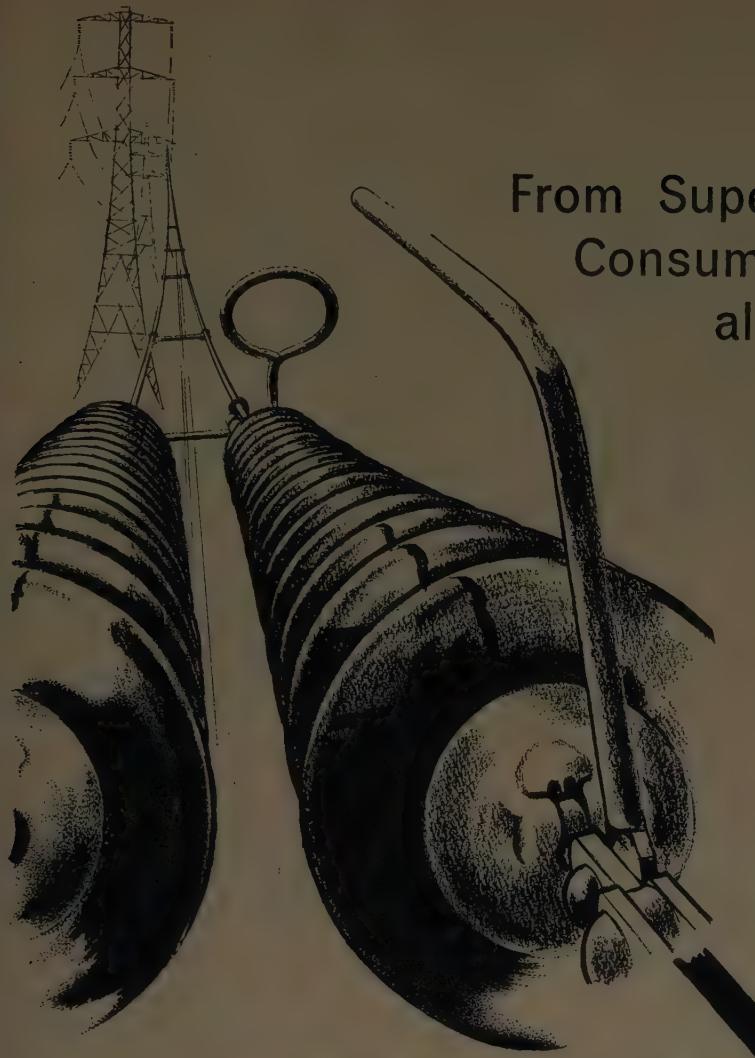
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From Super Grid to Domestic
Consumer, Porcelain Insulation
all the way

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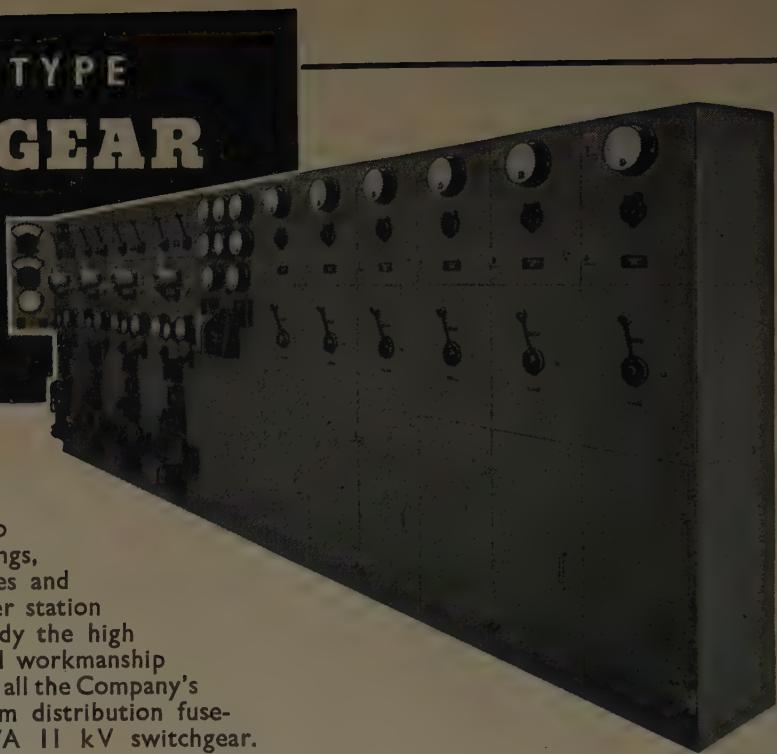
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CUBICLE TYPE SWITCHGEAR

MEDIUM
VOLTAGE

Switchboards of this type have been supplied to hospitals, public buildings, banks, industrial premises and for the control of power station auxiliaries. They embody the high standard of design and workmanship which is to be found in all the Company's products ranging from distribution fuseboards to 250 MVA 11 kV switchgear.



THE NEW SWITCHGEAR CONSTRUCTION CO. LTD.
WELLESLEY ROAD · SUTTON · SURREY · TELEPHONE: VIGILANT 8234

Associated with Hackbridge & Hewitt Electric Co. Ltd.

Industry is going over to these Nylon Bushings in a big way
they're



NYLON STRAIN RELIEF BUSHINGS

(FULLY PATENTED)

Since their introduction to Britain from the U.S.A. I.M. NYLON STRAIN RELIEF BUSHINGS are being used by an ever-increasing variety of trades—Clocks, Radios, T/V., Fans, Toasters, Mixers, Vacuum Cleaners, Washing Machines, Portable Tools, Air Conditioners, Electric Mowers, Clippers, Drills, Saws, etc. They are rapidly becoming "Standard" where a positive, insulating, non-slip grip is essential. Made from Nylon, they grip tightly without nipping and give a streamlined appearance to the job.

Some typical applications of I.M. Nylon Bushings



Easily applied—place Bushing on wire, push into hole—that's all!

May we send you samples and technical leaflet?

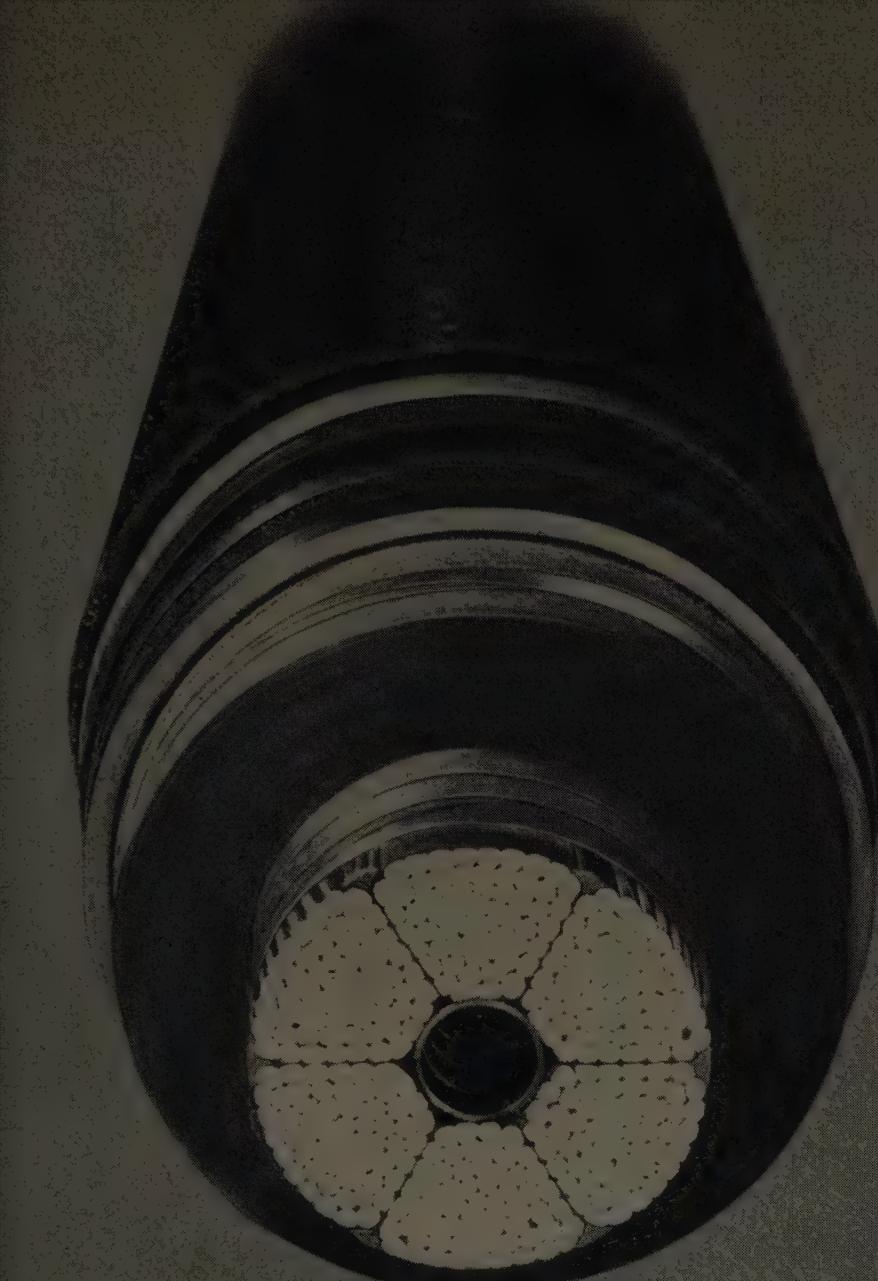


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Canadian, Norwegian,
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*This
cable
carries
1700
amps*

230kV

BICC

power cable for TORONTO



Manufactured to the order of the Hydro Electric Power Commission of Ontario for a new underground power link between Haig Junction and Applewood Junction in Toronto, this cable will provide two 3-phase circuits — each designed for operation at 230kV.

The oil-filled paper-insulated cable has a single 2750 mcm. conductor comprising six stranded segments laid round a central oil duct. It has been installed under the supervision of Phillips Electrical Construction Company Limited, a member of the BICC Group.

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 BLOOMSBURY STREET, LONDON W.C.1

progress & efficiency

call for

WANDLESIDE CABLES



The new B.B.C. Television centre uses Wandleside Cables.

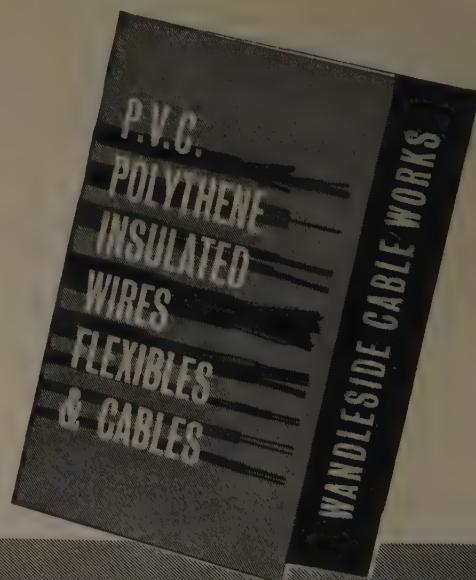
(Photograph by courtesy of the B.B.C.)

subjected to the most exacting tests to comply with the British Standard, Government or other relevant Specification. Reliability is our watchword. This is why you will find Wandleside Cables carrying the load in every major project in the Television, Radio, Electrical, Electronic and Aircraft Industries.

Our new catalogue gives you details and specifications of our range of Thermoplastic Insulated Wires and Flexibles.

We will gladly send you a copy by return of post.

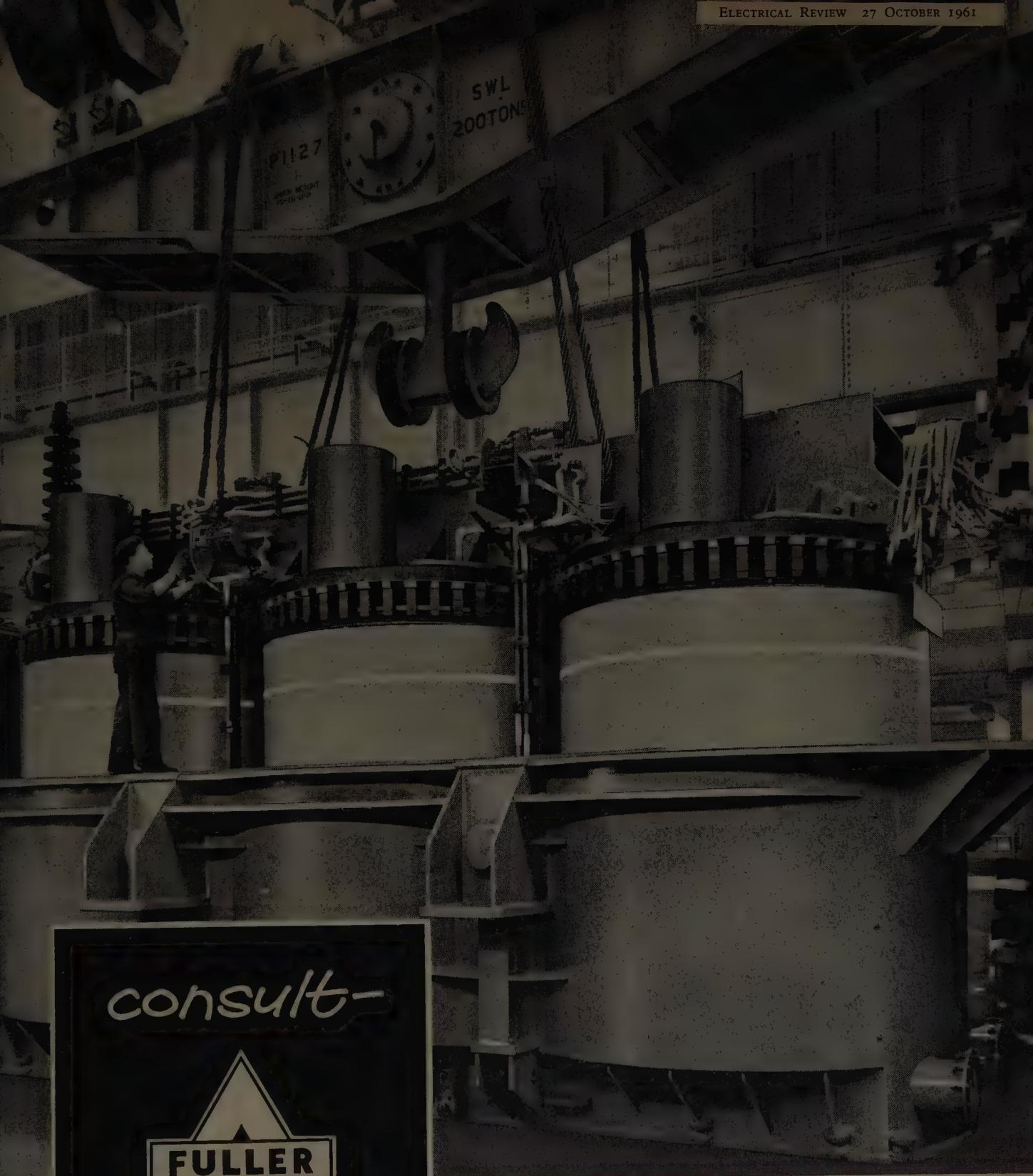
Every type of cable produced in the three factories of the Wandleside Cable Group is



WANDLESIDE

CABLES

for Radio and Television



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A member of the Hawker Siddeley Group

Sole U.K. representatives for ASEA Sweden
FULLER ELECTRIC LIMITED
 FULBOURNE ROAD - LONDON E.17
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Also at Birmingham, Glasgow and Manchester



One of the two Rectifier Transformers under construction at our Works for the C.E.G.B. Lydd Terminal Station of the Cross Channel D.C. Power Link. These units are rated at 95/95/65 MVA 284/83.6/33 kV and are believed to be the largest in the world.

Modern plant and more than 40 years' experience ensure that we are particularly well-equipped to manufacture transformers up to the largest sizes and the highest voltages. Our up-to-date equipment includes a large vacuum drying chamber, a 200 ton coil pre-shrinkage press and comprehensive plant for both routine and impulse testing.

**REGULATORS
FOR B.B.C. T.V.
- BY BRENTFORD**

At the T.V. Centre in Wood Lane, Shepherds Bush, the B.B.C. are using Brentford Regulators. Five of these stabilize all studio production lighting at a nominal 240v single phase, via dimmers. All are Class H Regulators made exclusively from material that will not support combustion.

Technical Details. To meet B.B.C. specifications, all the Regulators have to operate with minimum audible noise and waveform distortion. They range in rating from 30kVA to 250kVA, and can handle input voltage variations from +6% to -12%.

Brentford Transformers Ltd., Manor Royal, Crawley, Sussex. Tel: Crawley 25121. *A member of the GHP Group*

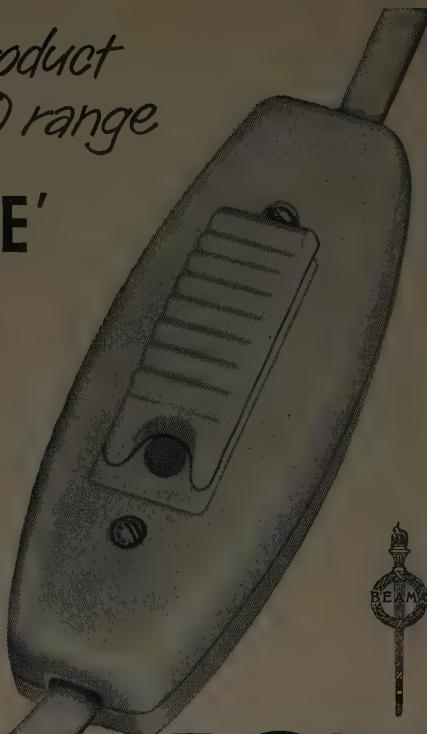
BRENTFORD B

Another top-quality product
from the AGRO range

The NEW 'SLIM-LINE'
AGRO
LINE CORD SWITCH

- * Particularly suitable for electric blankets and when so fitted conforms with B.S.S.
- * Neat and attractive appearance
- * D.P. Switch, A.C. ONLY
- * Silver-plated phosphor-bronze contacts
- * Positive cord grip
- * Supplied with alternative "ON" indicators — red spot or neon lamp
- * Cream bakelite
- * Moderately priced

'Red Spot' Indicator Cat. No. 7061
Neon-Lamp Indicator Cat. No. 7062



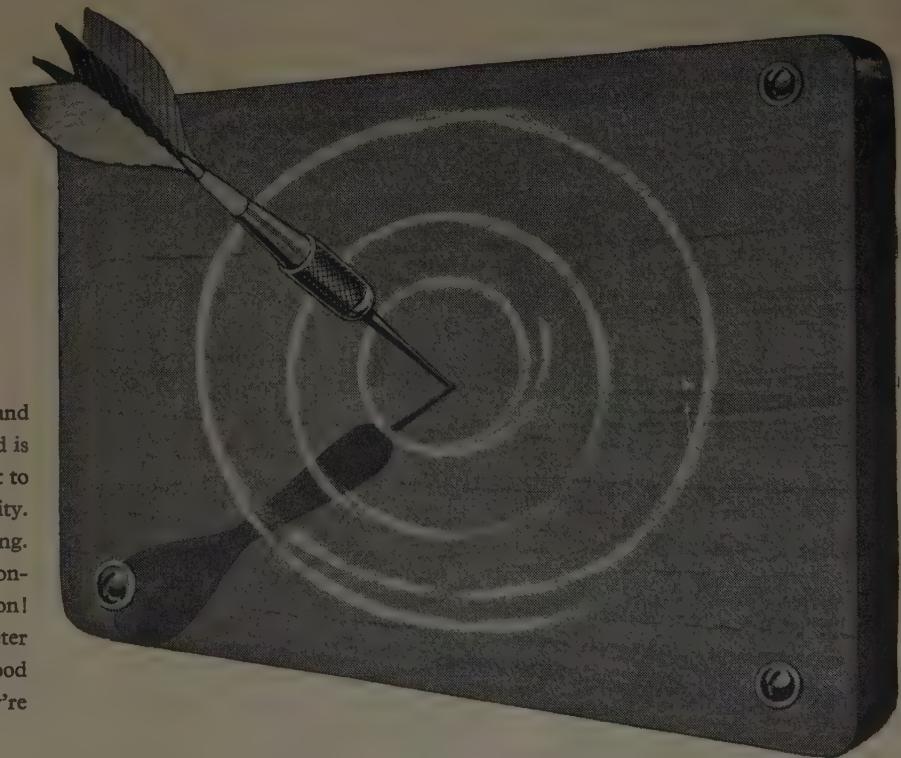
AGRO

Put Quality before all!

AGRO ELECTRICAL CO. LTD., 60/66 Wardour Street, London, W.1. Tel: GERrard 0721/2. Works: Aylesbury, Bucks.

Wootton meter
boards
score every time!

Bound to . . . if they're Wootton-made . . . and Wootton-tested! Only the stoutest plywood is good enough for Wootton. Every piece is put to the test. For reliability, toughness, durability. Wootton meter boards stand up to anything. Even in the most extreme climates. No contraction or expansion or warping with Wootton! Oh, and there's more to Wootton than just meter boards. They're right on the target with wood blocks too, and instrument cases, and they're brilliant at sunk switch boxes.



WOOTTON-the meter board people

WOOTTON & CO. LTD

ALMA WORKS · PONDERS END · MIDDX

Telephone: HOWard 1858



These cables will be as good as new in A.D. 2011

These gangers and jointers are laying cables made with aluminium conductors. It's a sight that is becoming increasingly familiar in British cities, from London to Glasgow. It means power PLUS for homes, factories, offices and mines. The PLUS is Alcan aluminium in those conductors. They will still be carrying their load 50 years from now.

The gangers are installing 4 core 3 sq. in. low-voltage distribution cables. Aluminium is also increasingly used in high-voltage and extra-high-voltage feeders. It has great advantages for the sheathing of pressure-type cables. Jointing presents no problems.

Today, aluminium is the cheapest conductor material. Alcan production capacity and Alcan research make sure that it will hold its lead.

Cable manufacturers can give you further advice on aluminium cables. Write to them, or write to us : Alcan (U.K.) Limited, Aluminium Canada House, 30 Berkeley Square, London W.1. Telephone : Mayfair 9721.

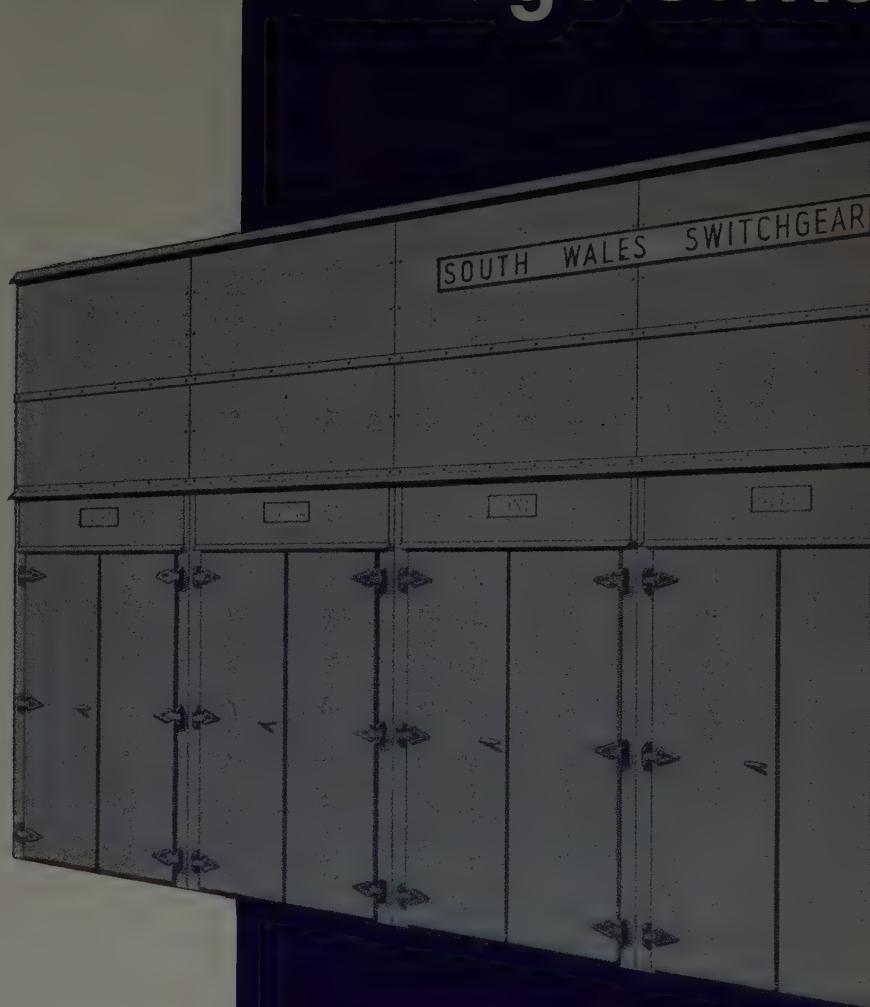


Britain's most widely used aluminium — from Canada

ALCAN

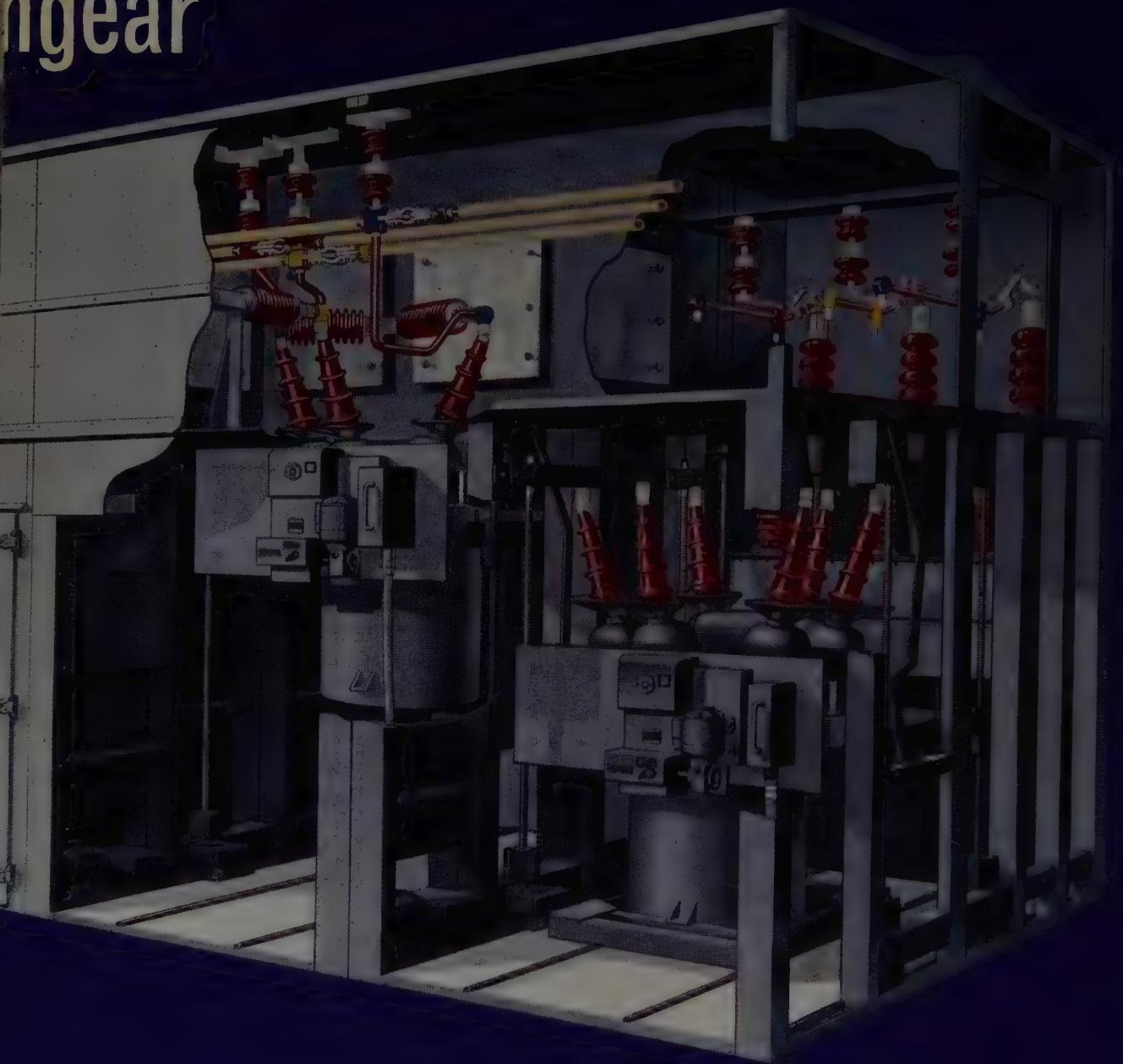
SOUTH WALES S

— the only 33kV Package Switchgear
fully proven in service all over the world



SWITCHGEAR

ngear



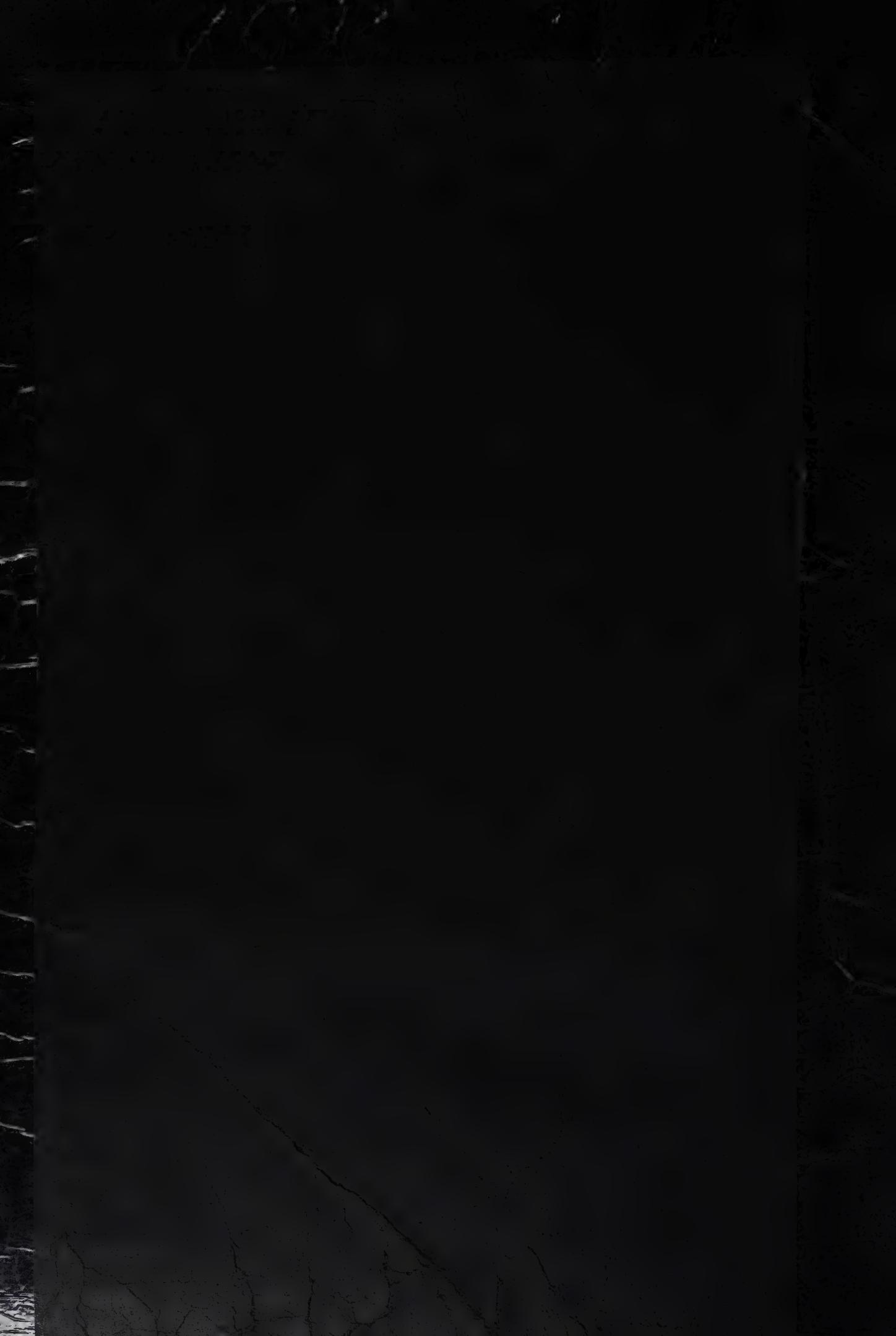
OVERSEAS

This air-insulated package switchgear unit is the most modern and economic development in 33kV switchgear and has, since its introduction, given reliable and efficient service in many overseas countries.

GREAT BRITAIN

Installations have been made with the E.E.B., E.M.E.B., M.E.B., N.W.E.B., S.E.B., S. WALES E.B., S.E.E.B., S. West E.B., S. of Scotland E.B., and with the Central Electricity Generating Board (S. Wales Div.) and the National Coal Board.







PROOF POSITIVE



S.W.S. PRE-PLANNING SAVES TIME & MONEY



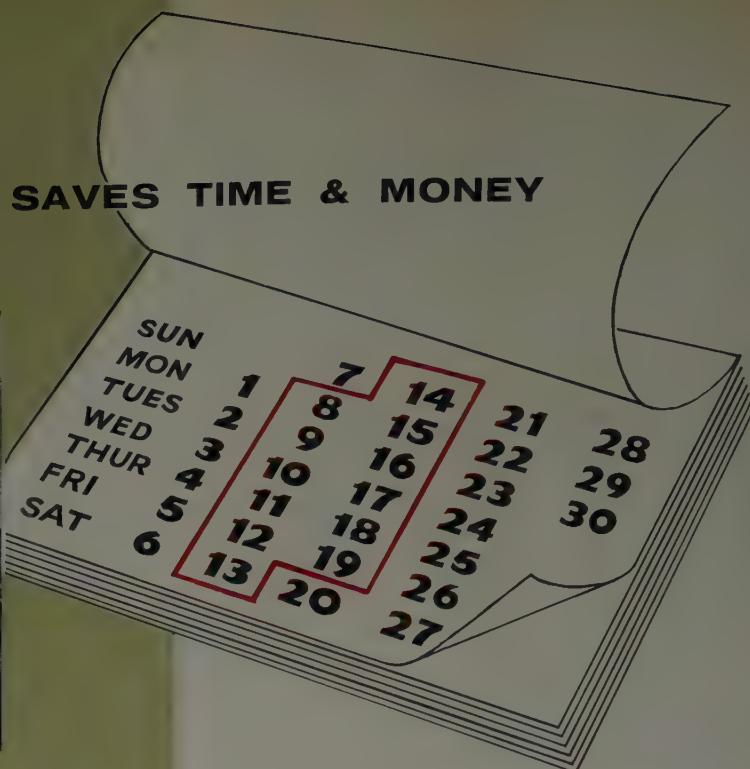
The base frame is laid on the concrete plinth



Assembly of top deck is commenced, following erection of the side frames



Ferralloys Substation, Anglo-Transvaal Ltd., S. Africa
— installation complete



IN A MATTER OF DAYS

The speed with which S.W.S. 33kV package switchgear can be installed is phenomenal in the field of extra high voltage switchgear. There are instances of switchboards being completely installed within 12 days. Speed and ease of erection is due to accurate factory planning and the completion of the bulk of drawing office work by S.W.S. draughtsmen prior to delivery to the site. All that is required is a single concrete plinth on which the base frame is set.

Other advantages include:

- ★ *Minimum space requirements.*
- ★ *Economy in initial and maintenance costs.*
- ★ *Suitability for service in any climatic conditions.*
- ★ *Ability to fit into existing electrification schemes.*
- ★ *'In situ' inspection in all weathers.*
- ★ *Air-insulated, either single or duplicate busbar, fully tested and certified and complies in every respect with BS116: 1952.*
- ★ **RATINGS:** 33kV, up to 1000 MVA and currents up to 2000A.

Write for catalogue leaflet No. 60





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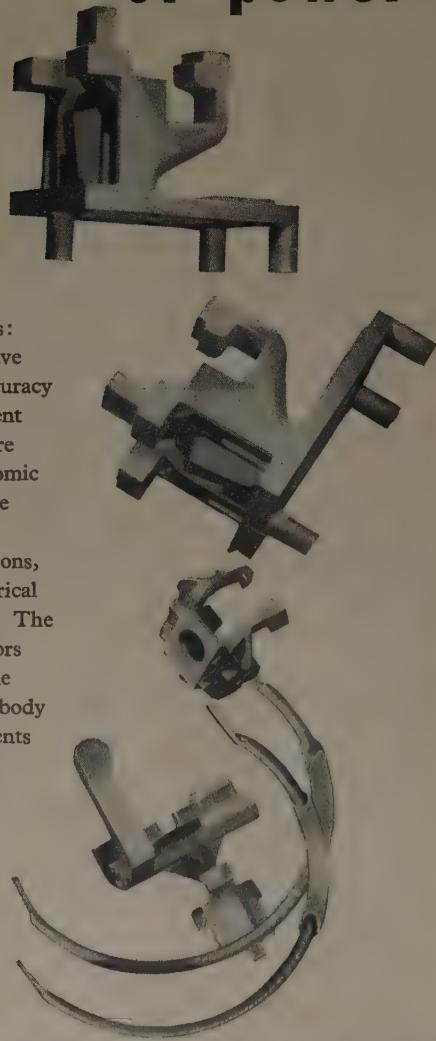
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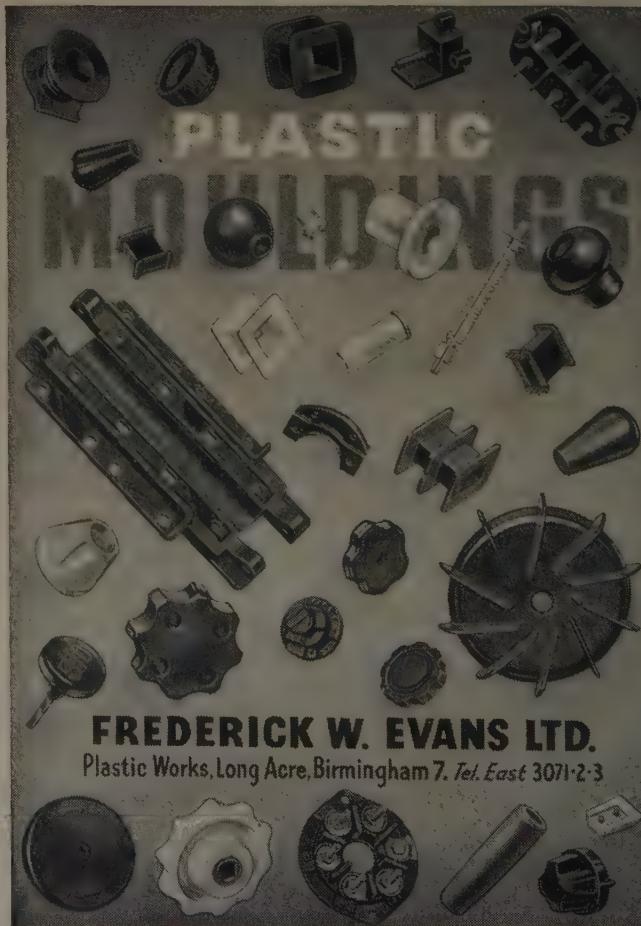
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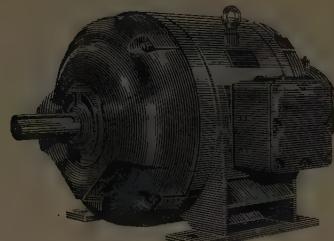
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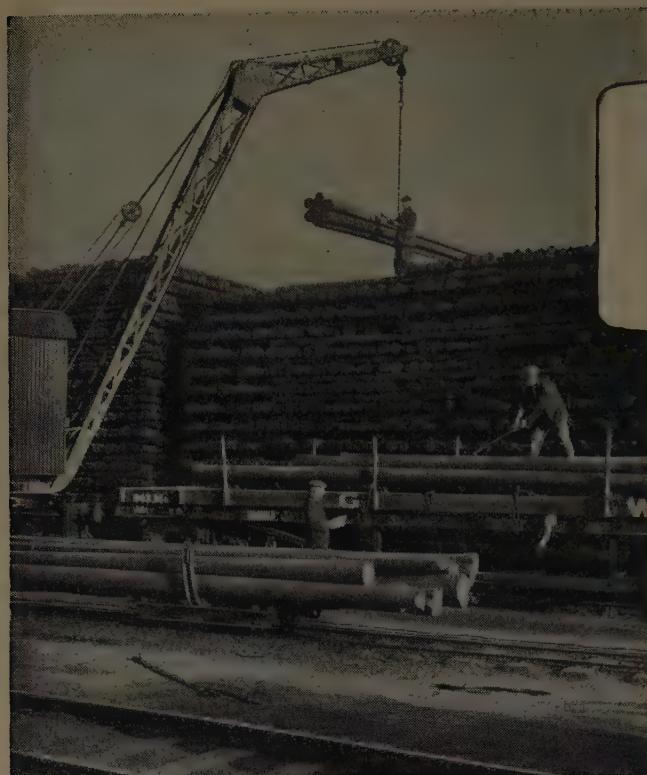
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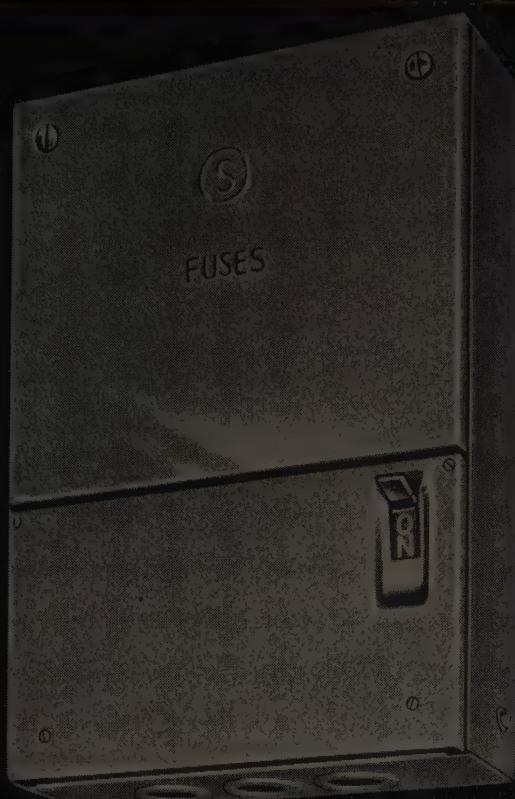
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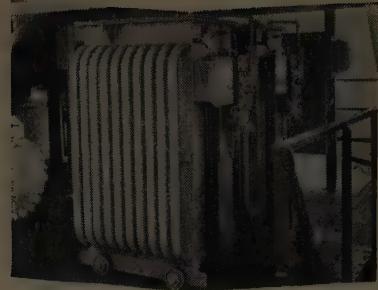
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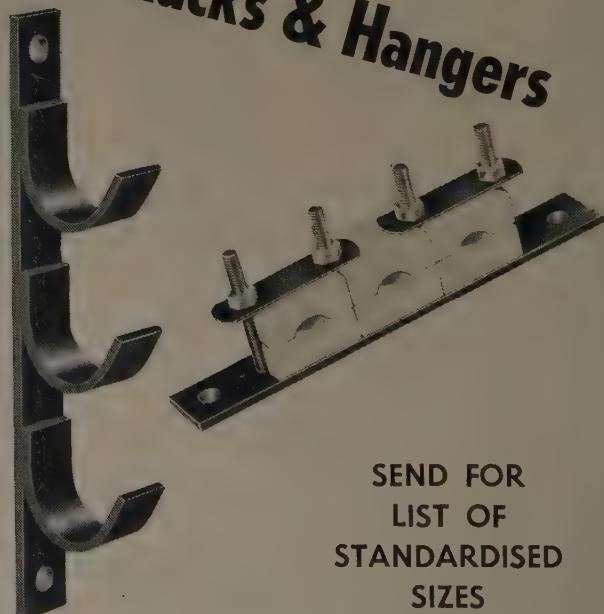
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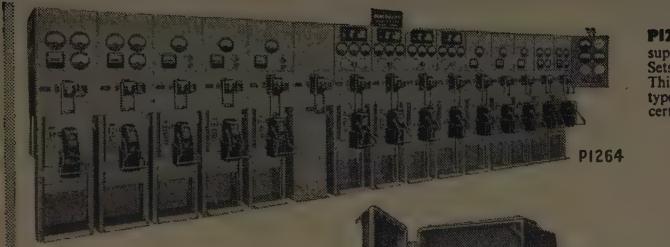
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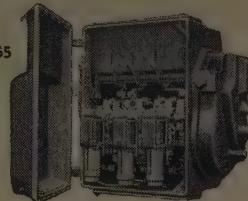
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PI264

P 955

P 955 Illustration on the right is of a hand-operated air break star delta starter, fitted with interlocked isolator and solenoid type overloads with time lags. This starter can also be supplied as a direct-on starter.



PI264 Illustrated left, Switchboard recently supplied for controlling diesel Alternator Sets and Feeders at a large Sewage Works. This Switchboard is of the duplicate busbar type and contains circuit breakers ASTA certified at 25 MVA to BS. 116 at 400 volts.



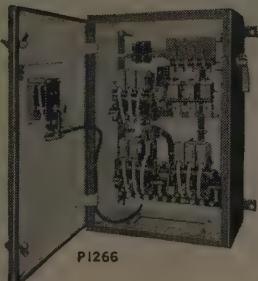
PI044 Illustrated right. Combined type stator and rotor starter showing tank removed. No interlocks required as stator and rotor contacts are on same drum in correct sequence. There is also a great saving in floor space.

PI044

CONTACTOR TYPE SWITCHGEAR & MOTOR CONTROL GEAR



P 1327 Illustrated right, multi motor contactor type Switchboard recently supplied for controlling air conditioning and refrigeration plant in the Middle East.



PI266



PI267

PI266 Starter illustrated above is one of our CS. 30 pattern star delta starters, suitable for use up to 20 H.P. This type of starter is made in different ranges up to 250 H.P.

PI267 Starter illustrated at the left is a 50 H.P. CS. 75 type stator and rotor starter. This starter is made in different ranges up to 250 H.P. All our contactors above the CS. 15 size are bar mounted with powerful magnetic blowouts.

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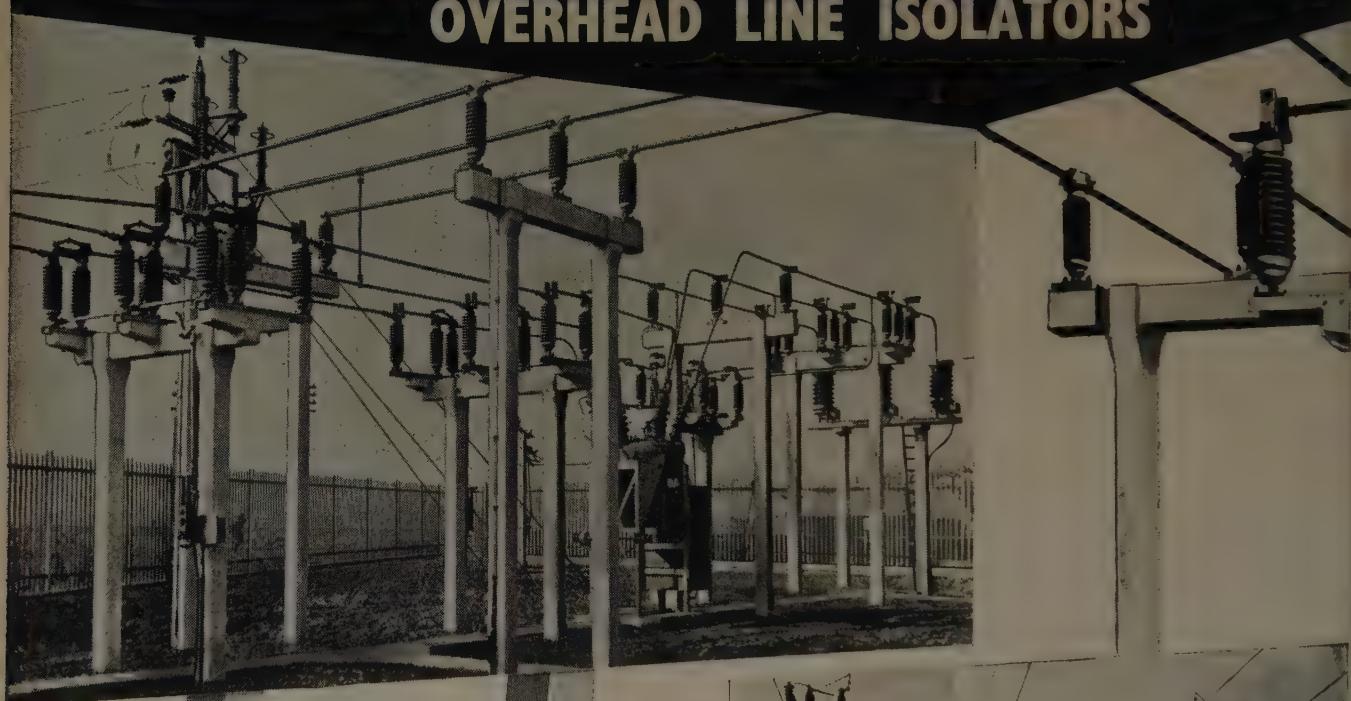
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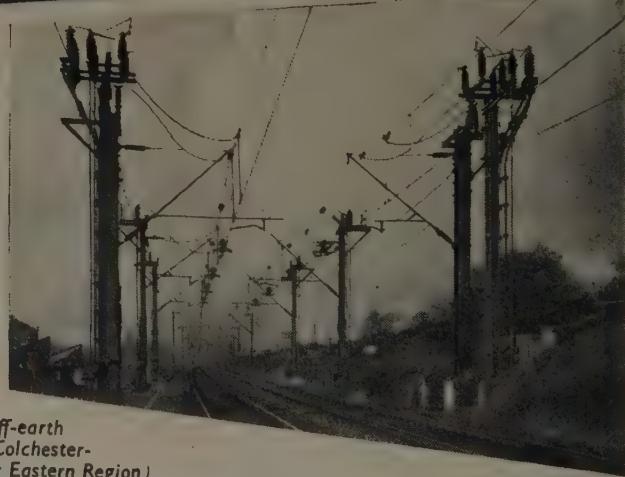
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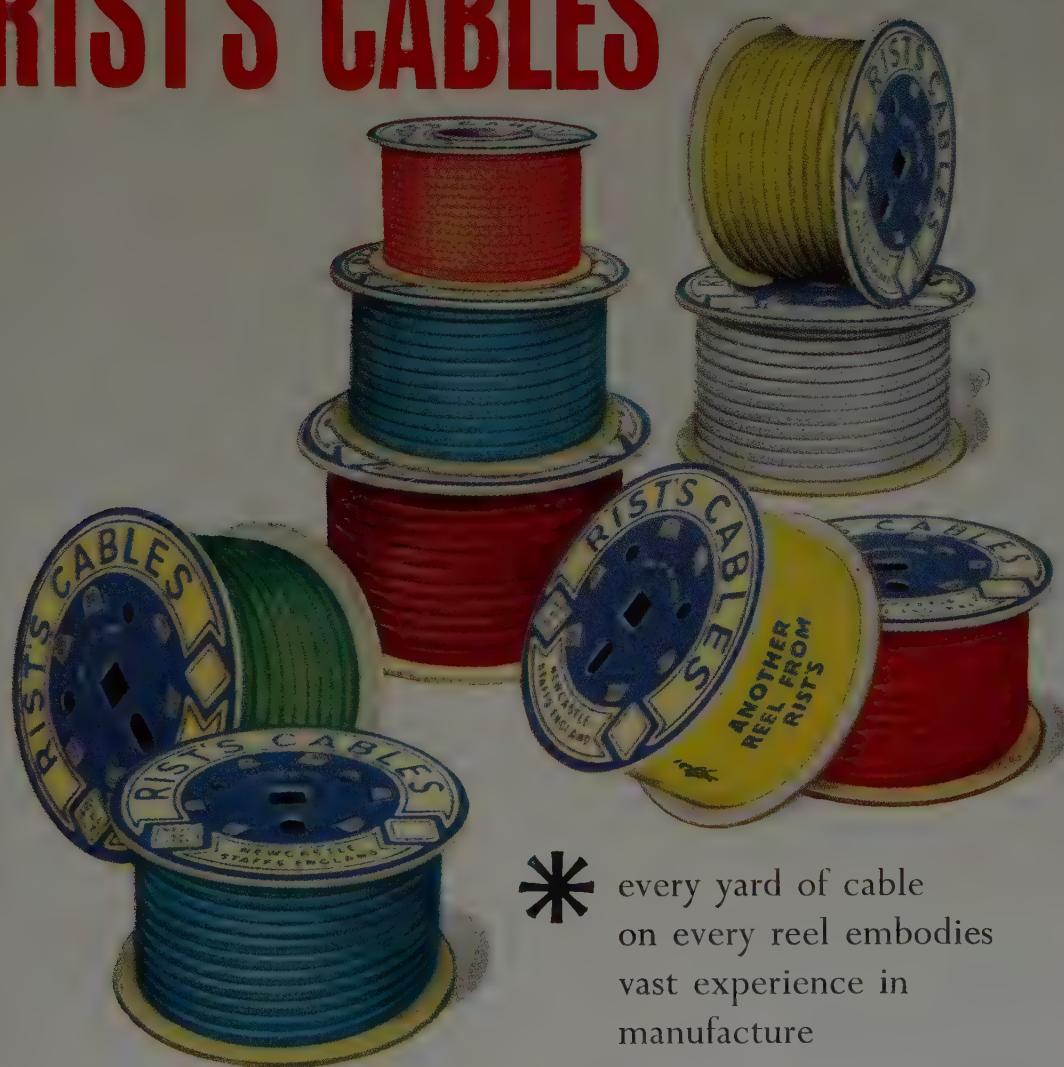
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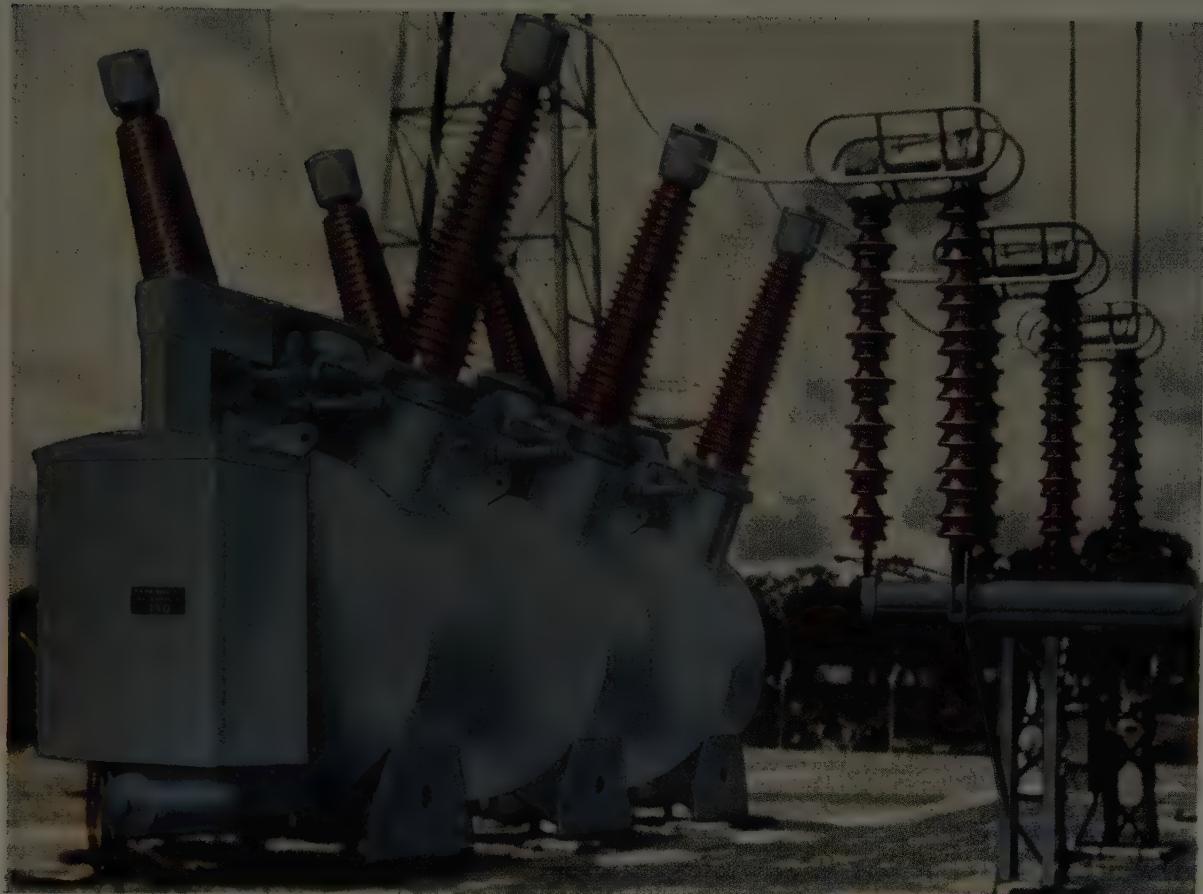
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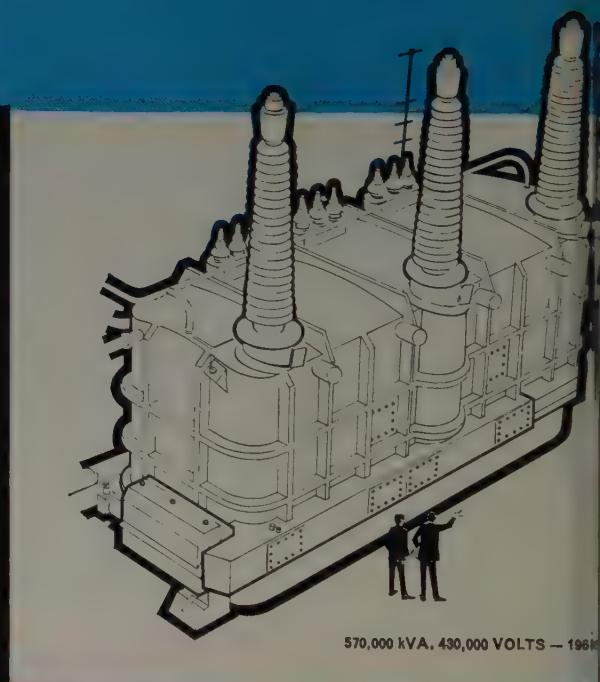
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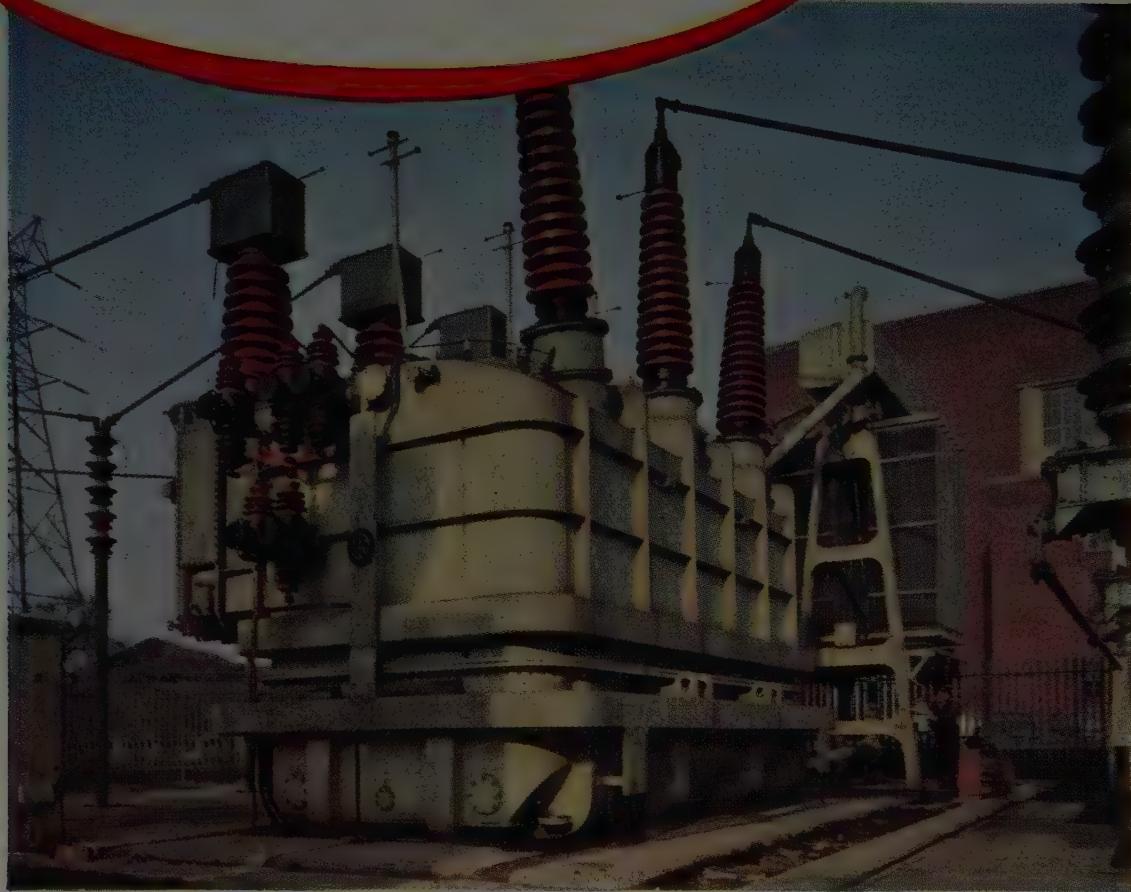
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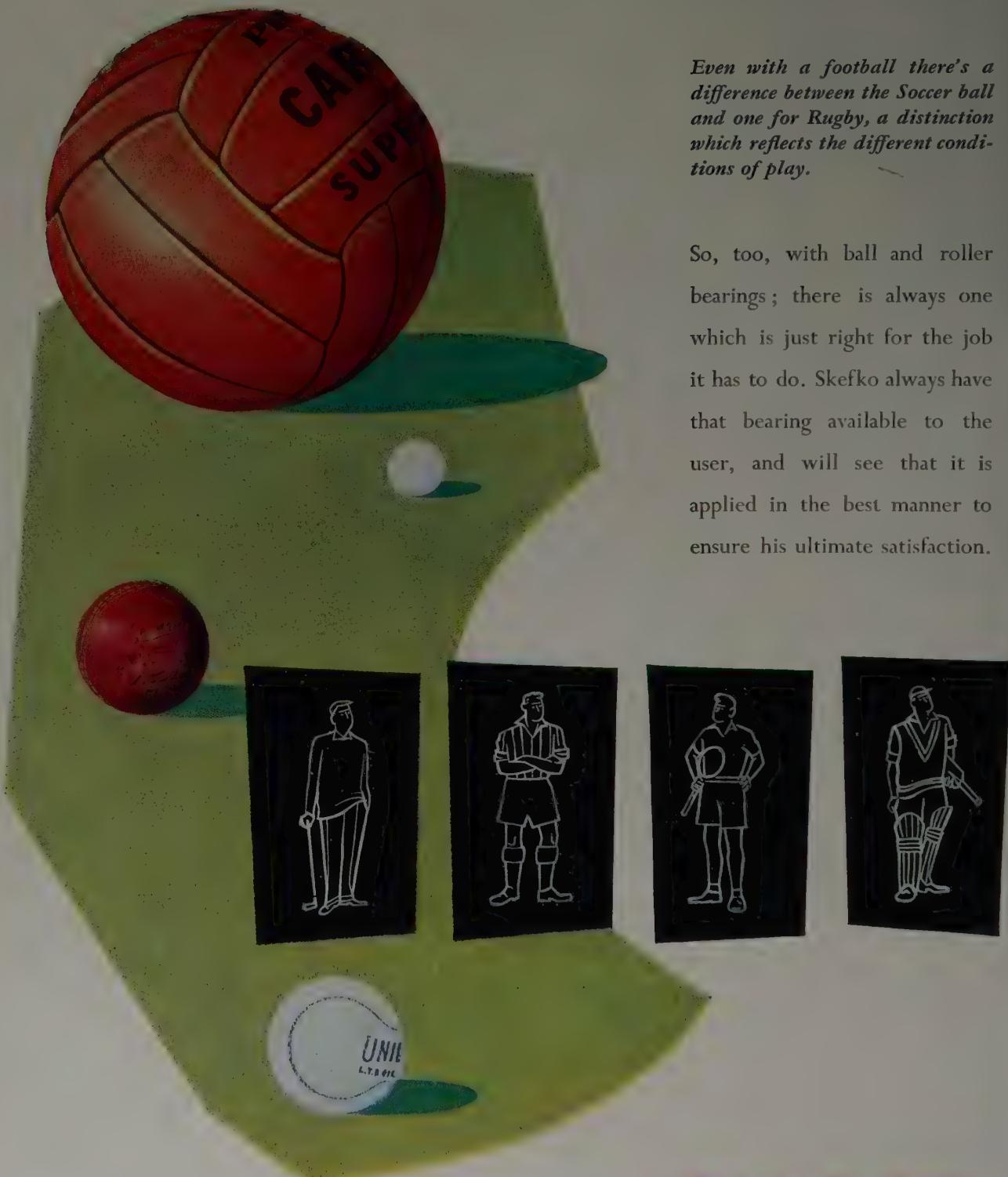
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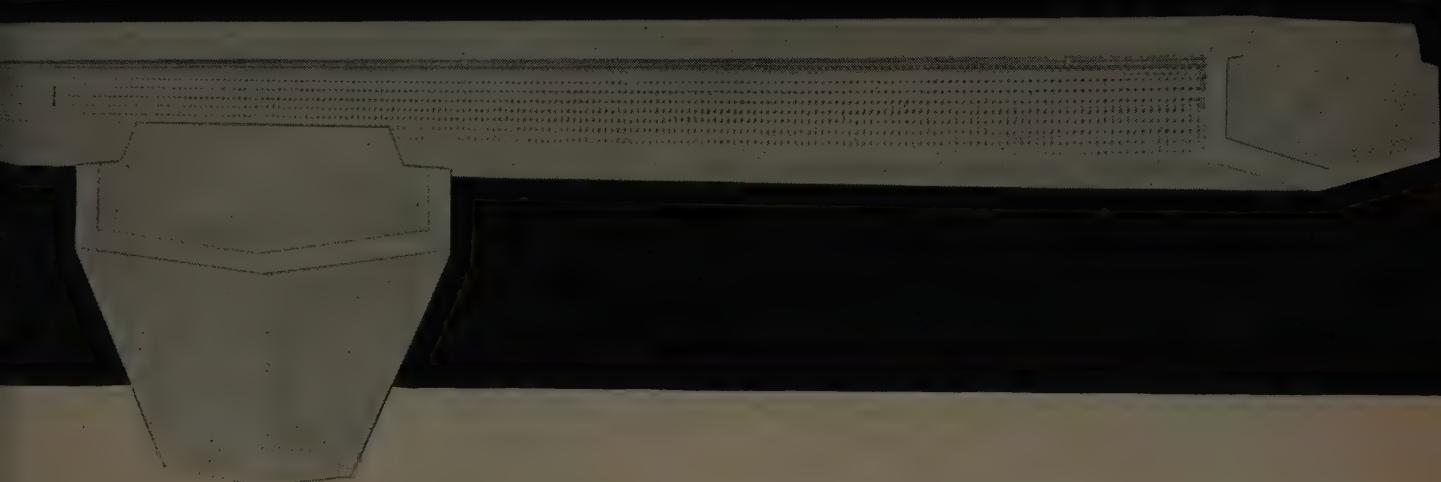
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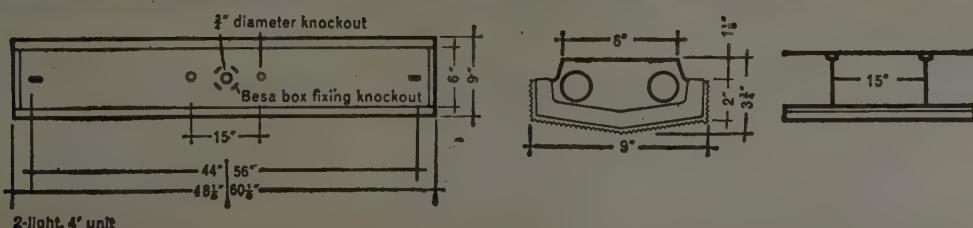
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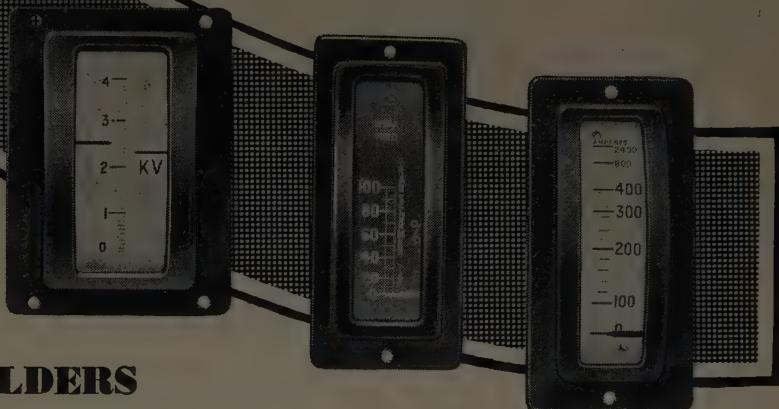
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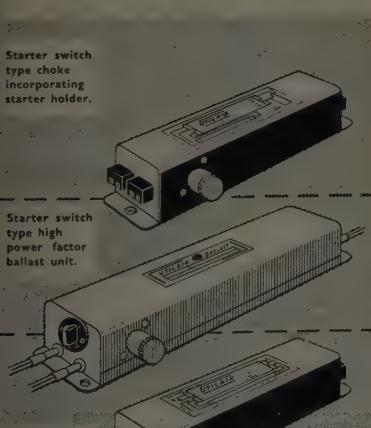


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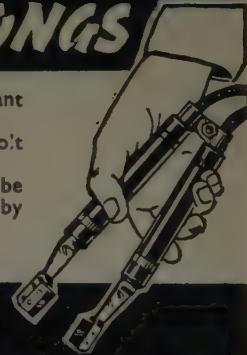
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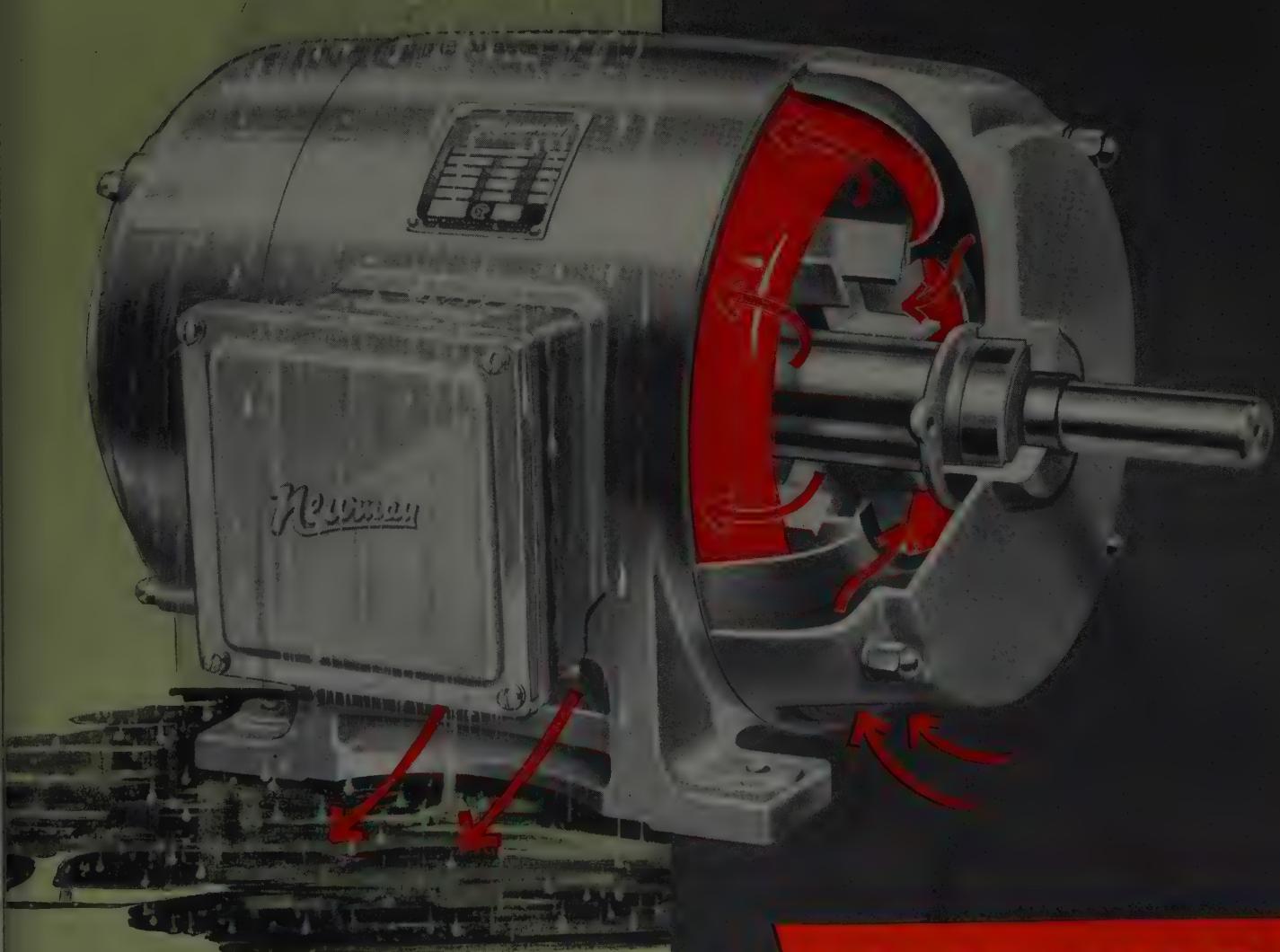
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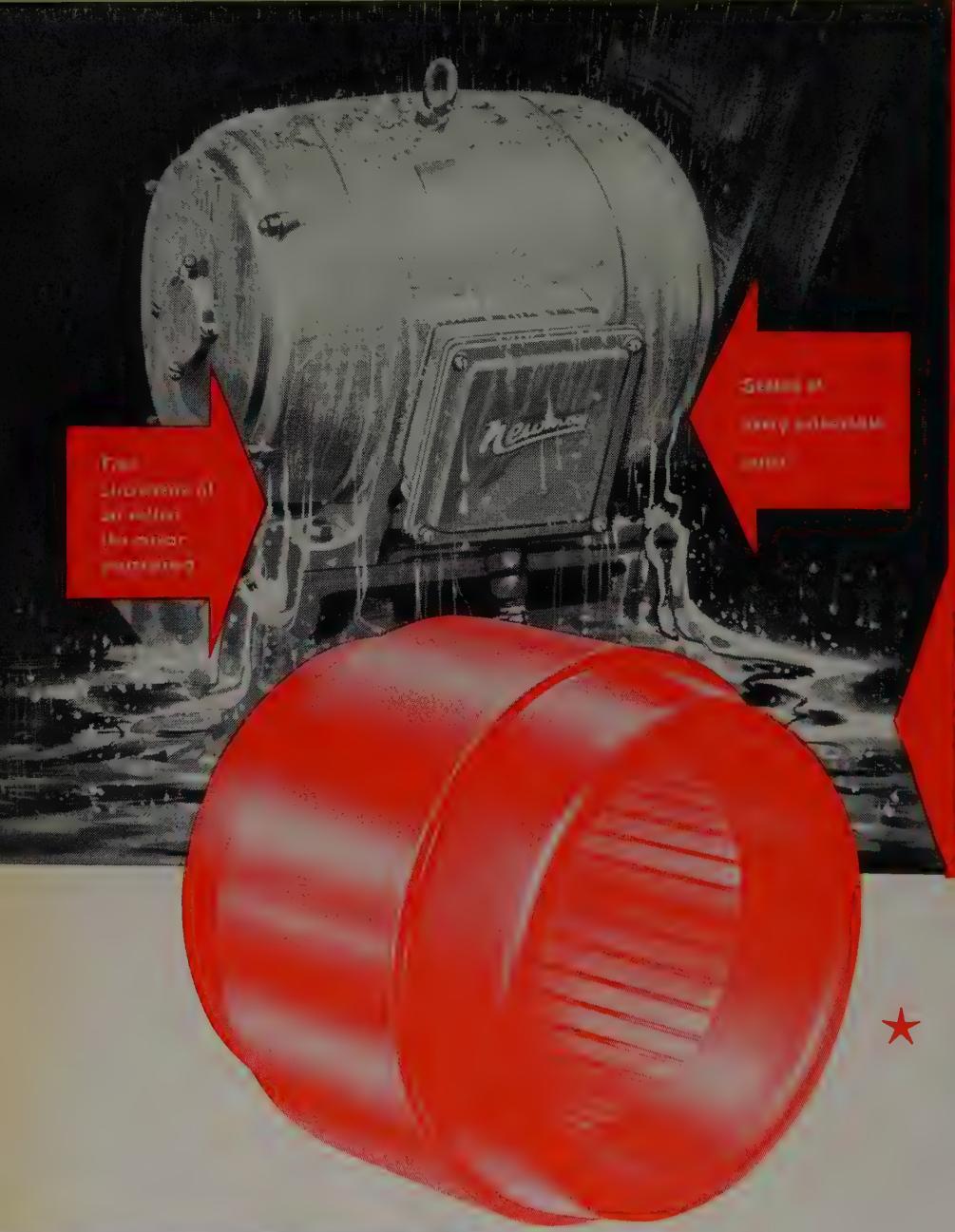
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for use in applications where **WATER, OIL, CHEMICALS or AIRBORNE ABRASIVES** are present.

BETTER THAN TOTALLY ENCLOSED. Tests have proved that for many applications the 'NewmanSEAL' open motor is more satisfactory because an enclosed motor 'breathes' and so can suck in damaging fumes to make contact with the windings. Also the free circulation of air within the 'NewmanSEAL' motor prevents condensation troubles which are not uncommon in totally enclosed motors.

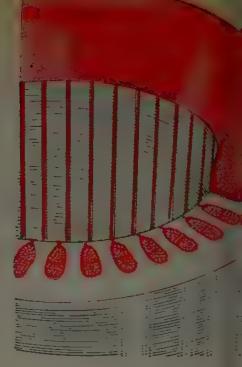


SPECIFICATION: Open (ventilated) 3-phase, squirrel-cage, 50 cycles, 650 volts maximum. Temperature rise 65°C, Class 'E' insulated. To BS2613:1957 NEMA Standard Dimensions. Range: $\frac{1}{2}$ to 125 hp.



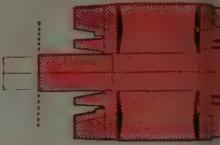
EPOXY RESIN ENCAPSULATED STATOR WINDINGS

The epoxy resin, which has excellent dielectric qualities is applied in liquid form and penetrates deep into the windings, as this sectioned view illustrates. Also the stator bore is sprayed with epoxy resin to help protect the laminations against corrosion.



EPOXY RESIN PROTECTED ROTOR

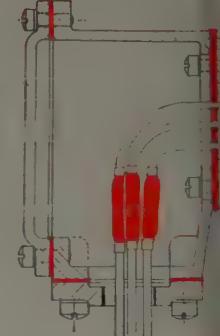
The rotor is sprayed with epoxy resin to help protect the 'open' surfaces against corrosion.



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Wide flanges and the use of gaskets between all joints ensures positive sealing. Also the opening between the terminal box and the inside of the motor is specially sealed.

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This illustration of the stator winding shows how the encapsulation completely covers and protects the coils. The formulation of the resin used gives a hard positive protection against mechanical damage and yet is resilient enough to withstand repeated expansion and contraction of the windings over their normal operating temperature range.

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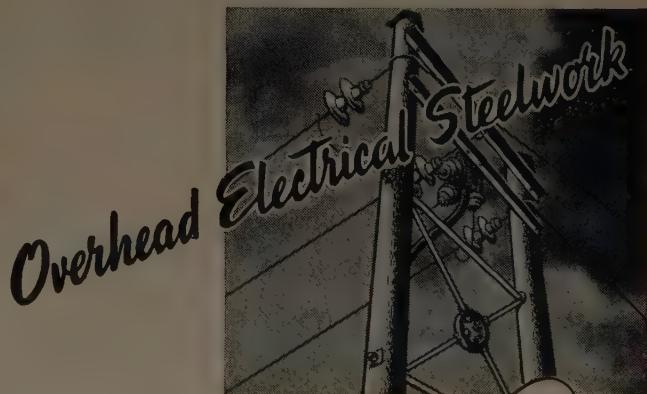
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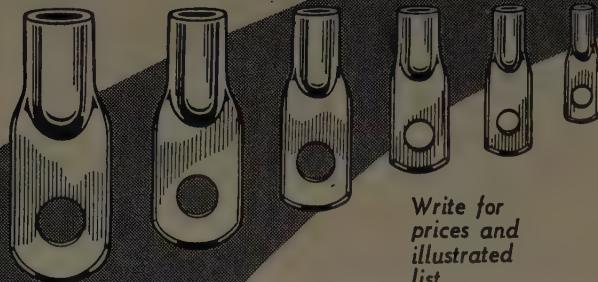
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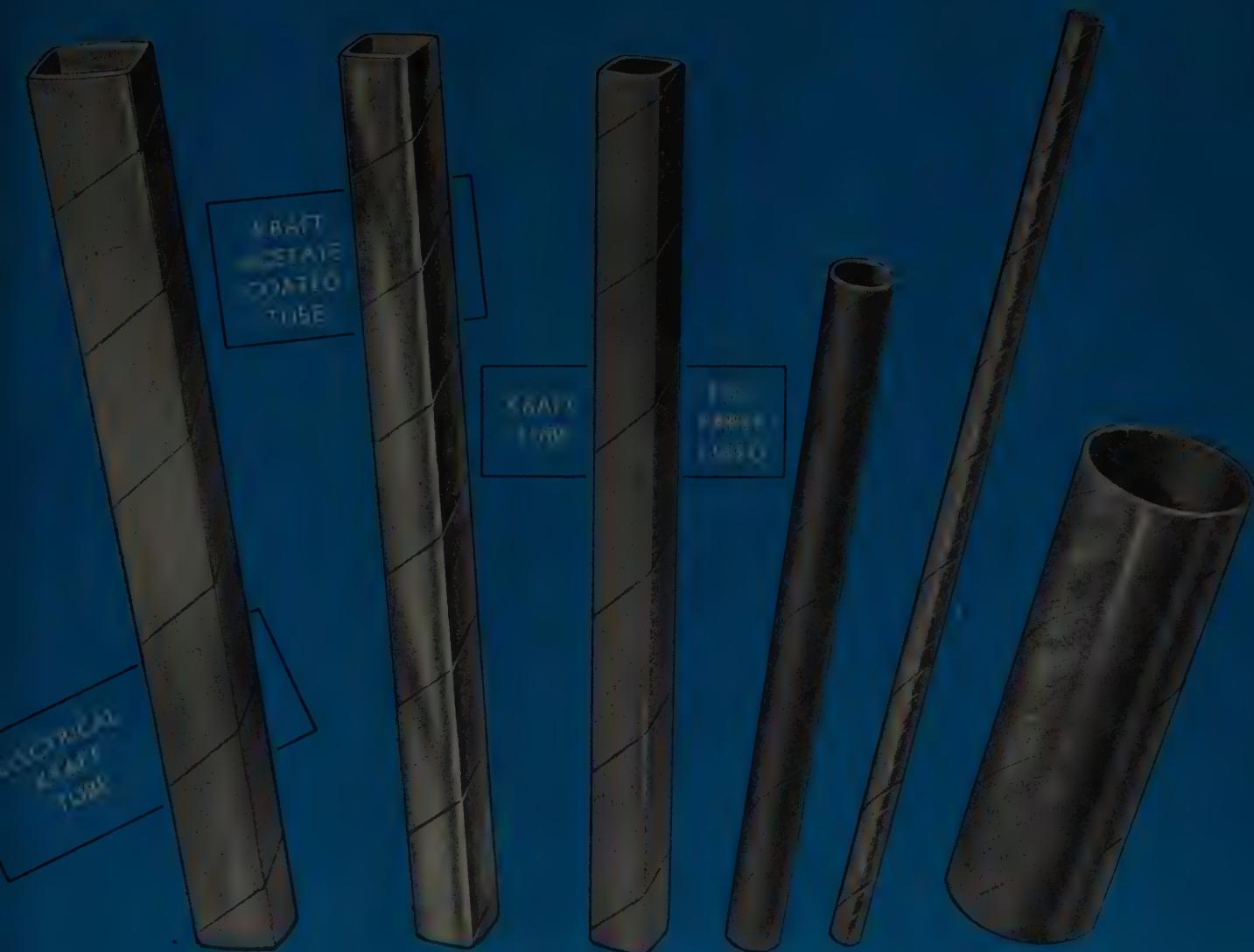


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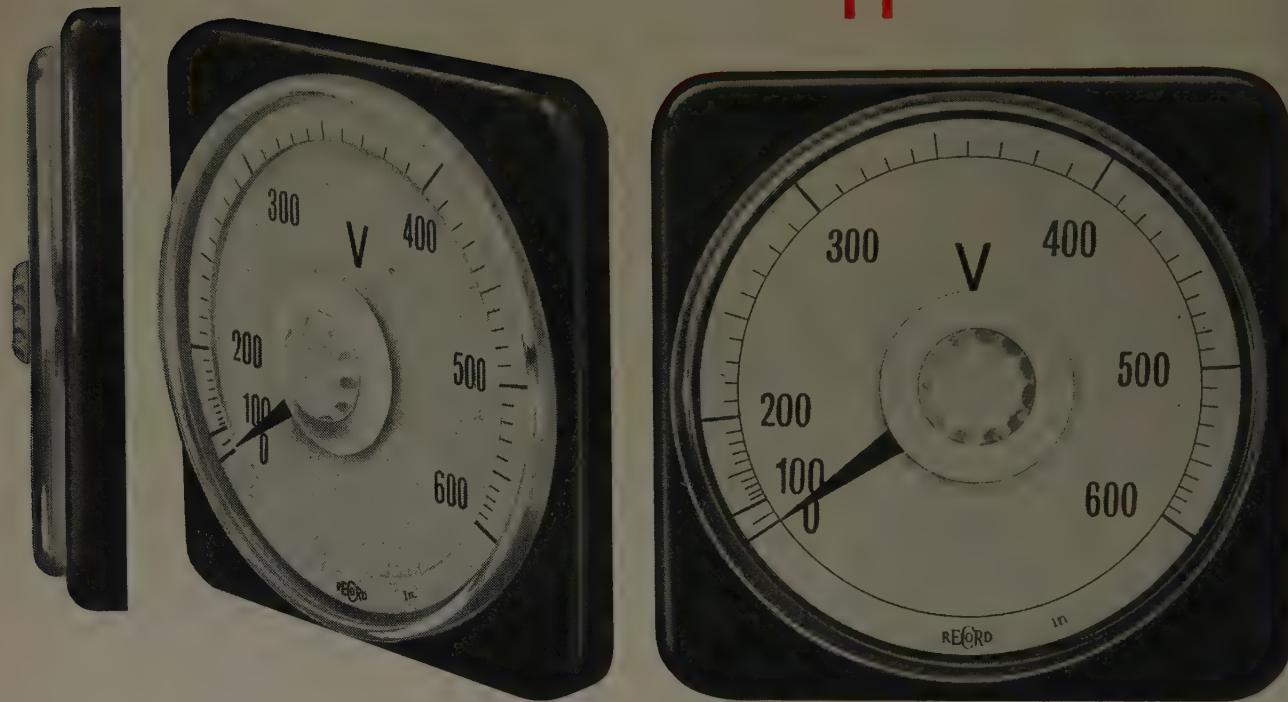
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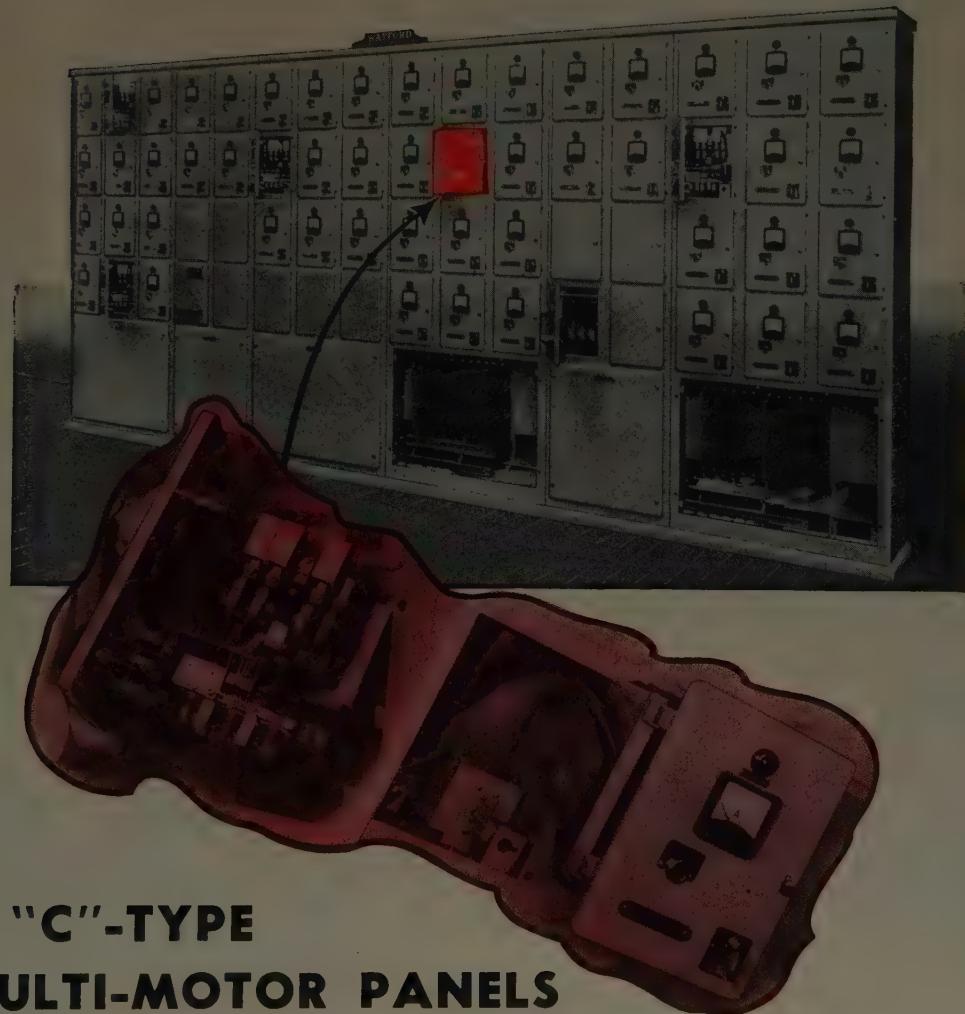
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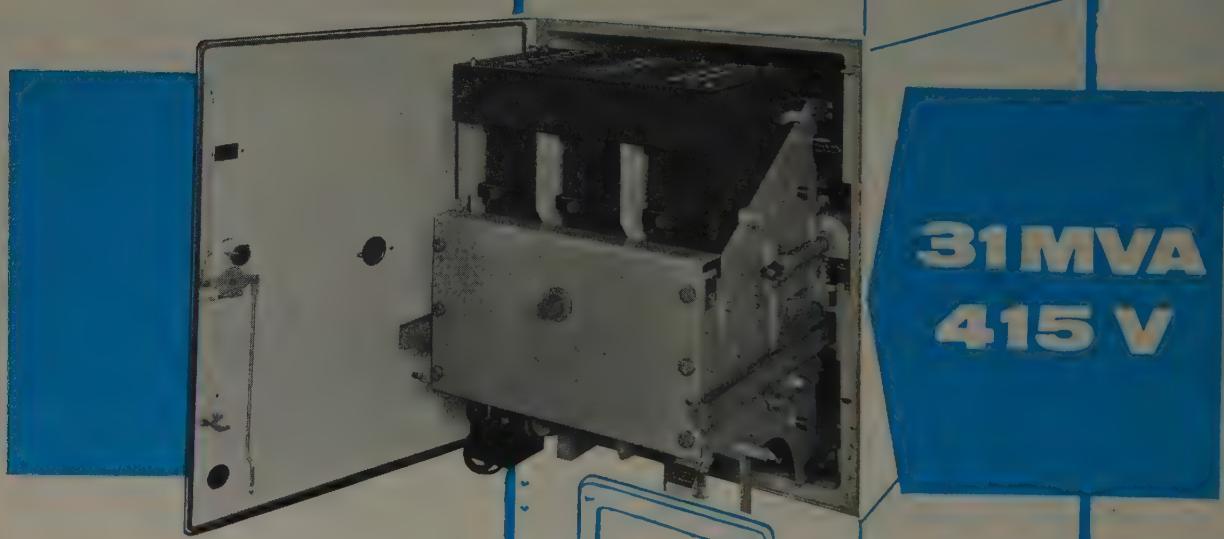
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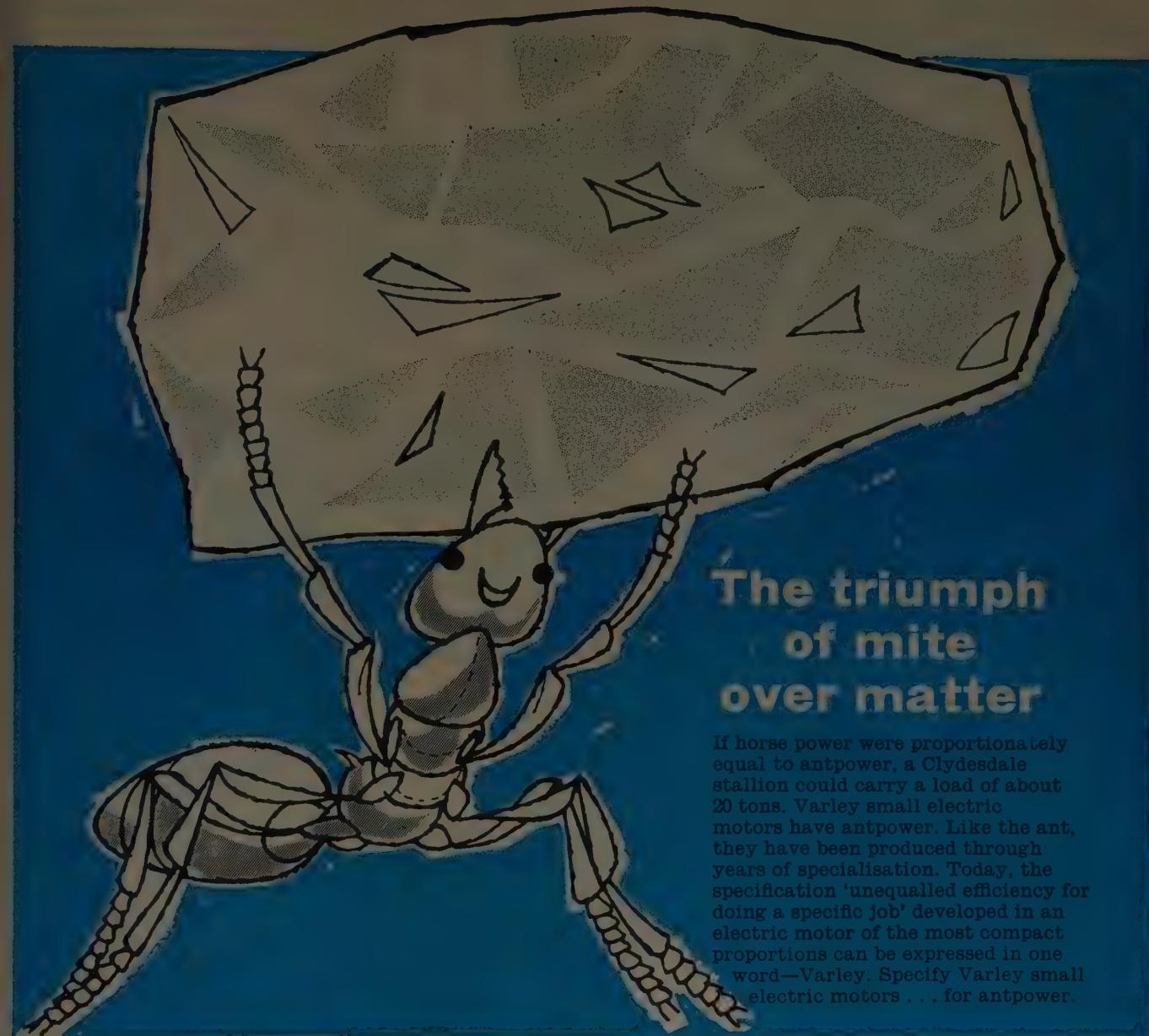


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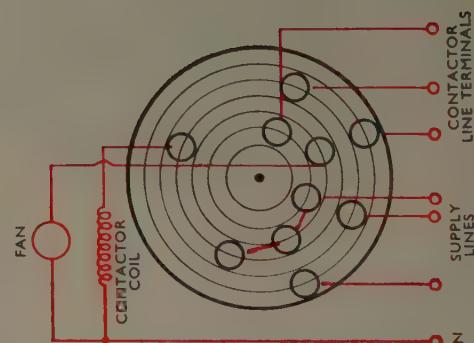
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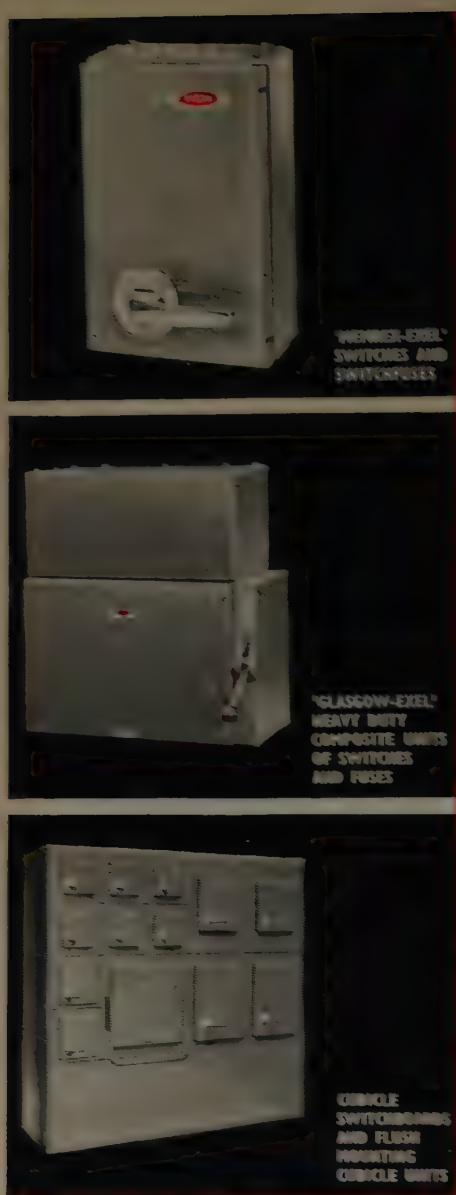
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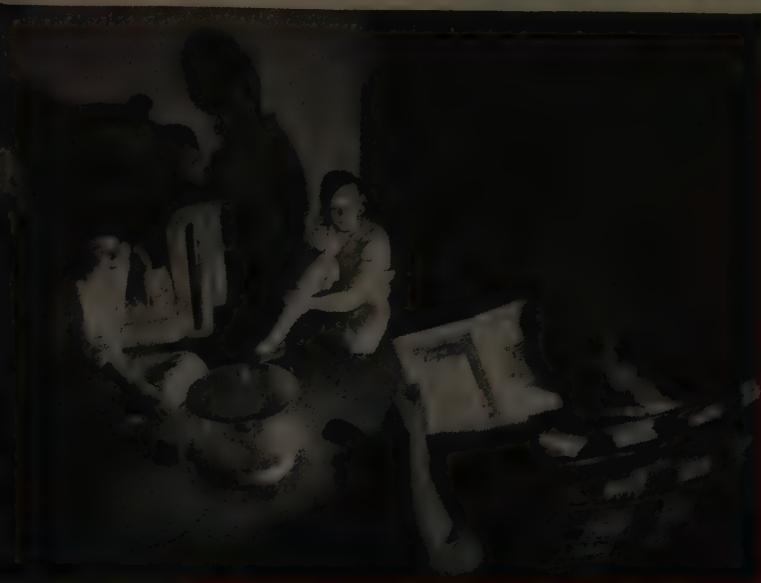
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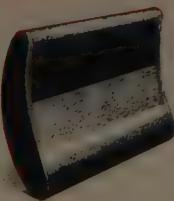
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HENDREY NC1 Alarm Relay

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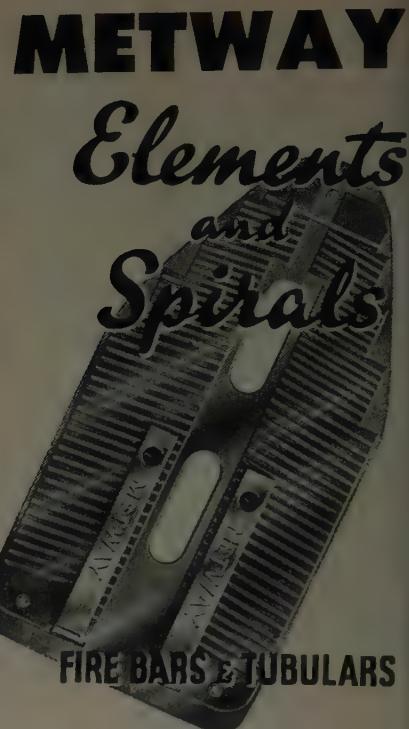
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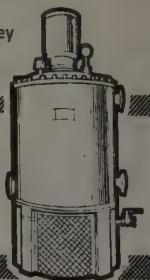
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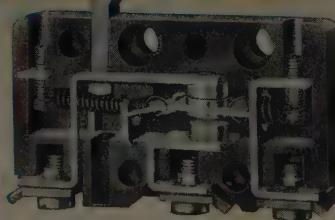
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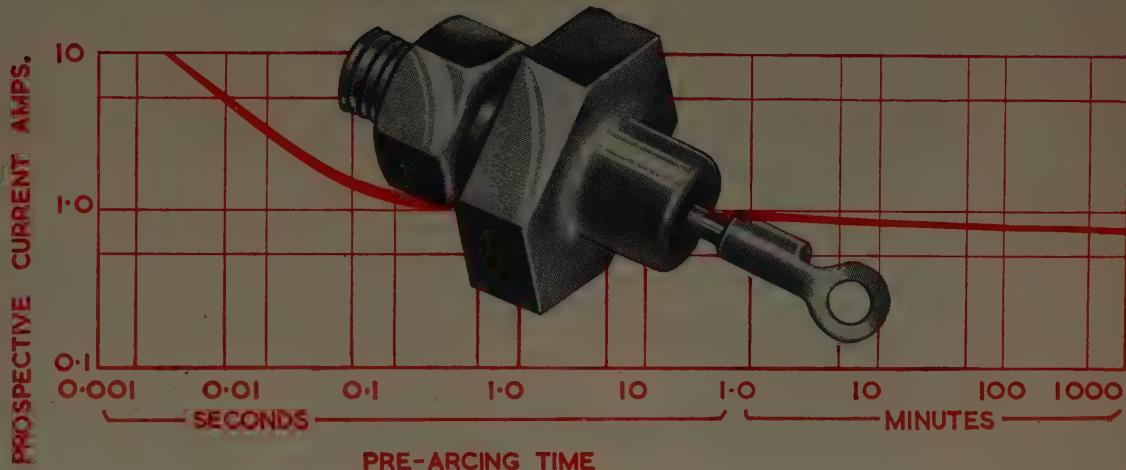
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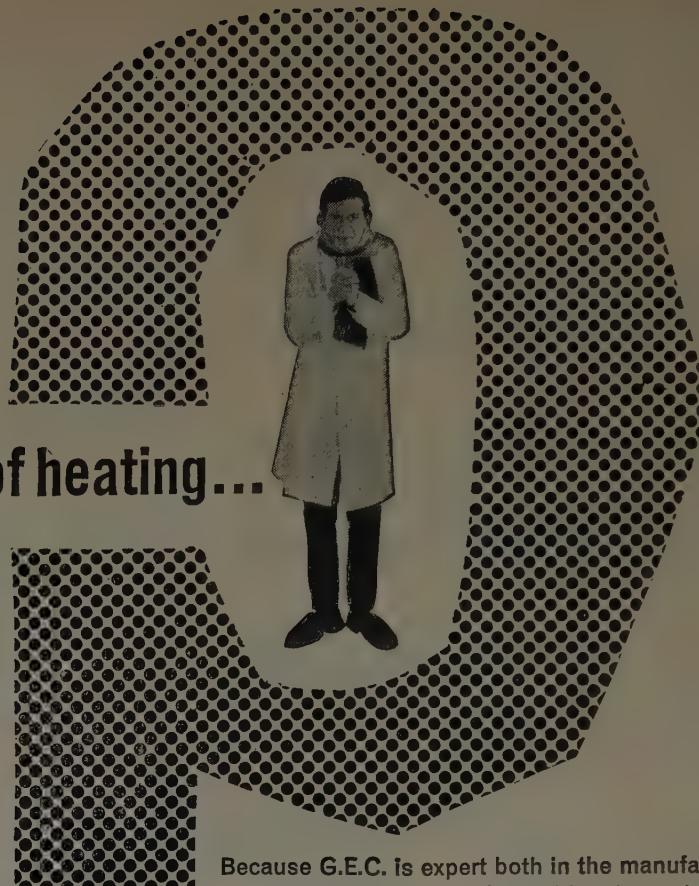
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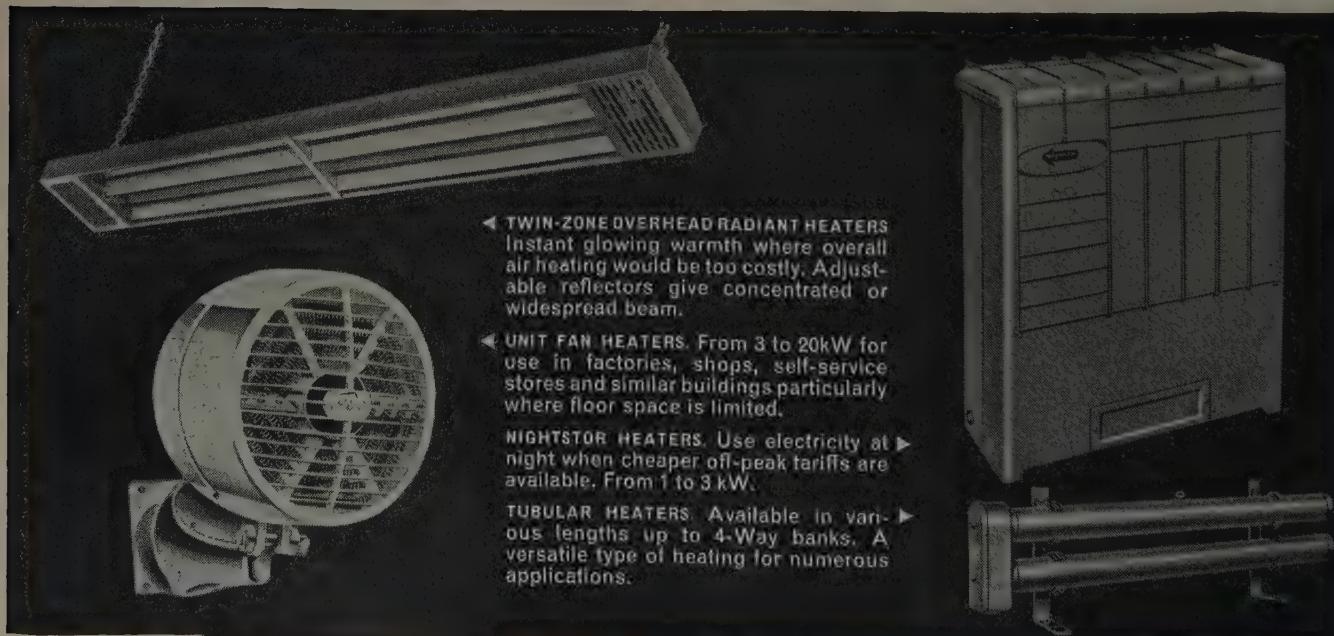


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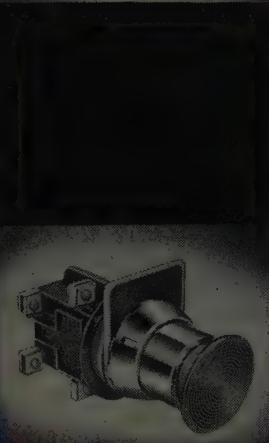
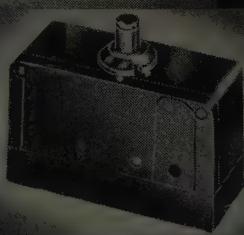
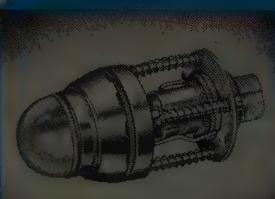
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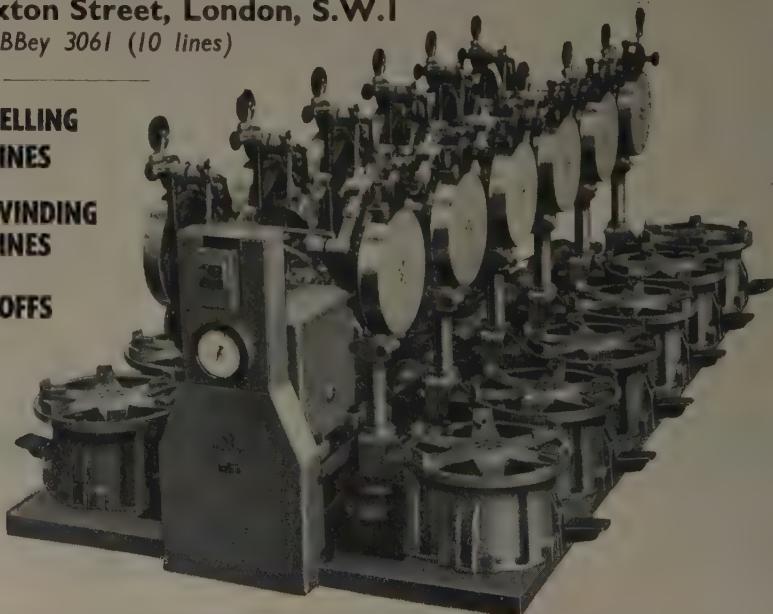
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ELECTRICAL REVIEW

Eighty-Ninth Year of Publication

Friday 27 October 1961 Volume 169 No 17

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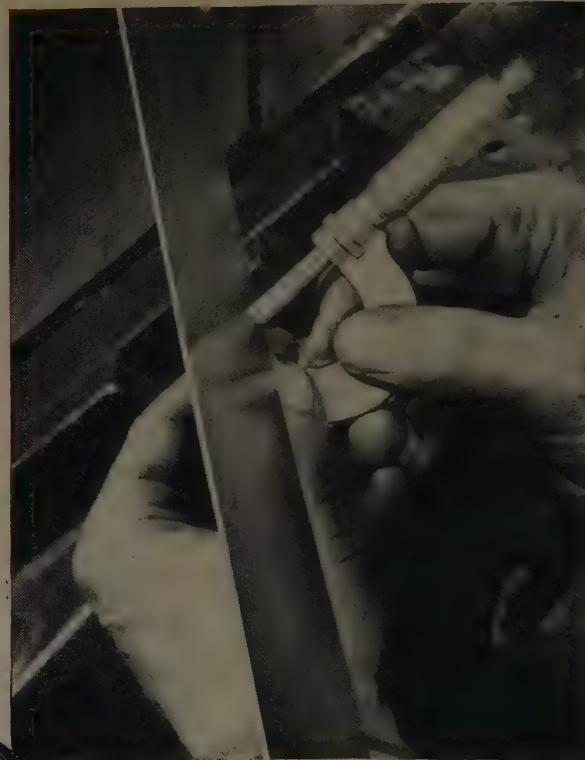


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ELECTRICAL REVIEW

27 October 1961 Vol. 169 No. 17 Established 1872

B.E.A.M.A. Sets its Sights

ONE sign of strength in a company organisation or industry is the ability to adapt its structure and outlook to the changing conditions in which it operates. Looking back over the fifty years since the British Electrical and Allied Manufacturers' Association emerged out of the apparently ineffectual National Electrical Manufacturers' Association one can detect a number of phases in the development of B.E.A.M.A. which have largely, but not altogether fortuitously, coincided with the periods in office of its different directors.

After the remarkable achievements during the twenty-five years that Mr. D. N. Dunlop was in charge, B.E.A.M.A. passed through a period of much less notable development. It was a time of consolidation during which the industry had to face many difficult situations including recovery from the slump, the war, nationalisation of the supply industry and legislation on restrictive practices. After the war, especially, the Association was largely pre-occupied with establishing recognition of the industry's contribution to the national economy and with defending its established practices. Since a trade association's main duty is to its members this may well have been the right policy. But with the advantage of hind-sight it could also be argued that the emphasis on individuality under a system of voluntary co-operation, and the concomitant price policies, hindered the industry's adjustment to more competitive conditions. If there is a lesson to be learnt from the B.E.A.M.A.'s history it is surely that in addition to the services provided for members, the Association must at times be ready to inspire and lead the industry.

A beneficial effect of the Restrictive Practices Act has been that attention has been directed away from prices to other forms of co-operation. Under the energetic and clear-sighted directorship of Mr. S. F. Steward, B.E.A.M.A. has seized the opportunity for a thorough appraisal of the Association's activities and policies. From the review of the broad lines of development in Mr. Steward's article in this issue, it is clear that B.E.A.M.A. is entering a period of renewed strength and usefulness. A key to the fresh approach is contained in the statement that "the over-riding duty of the B.E.A.M.A. in the future will be to ensure that Britain's electrical industry is both pro-

gressive and prosperous." But Mr. Steward wisely adds, with particular reference to exports, that "a trade association cannot provide a substitute for enterprise and initiative by its individual members."

The great scope for expanding the Association's services is clearly appreciated, particularly in the collection and dissemination of market information. It is also significant that Mr. Steward refers to B.E.A.M.A. as a federation of trade associations. While many problems are best left to specialist groups, there is every advantage in having a single body that can, when necessary, speak with authority for the whole electrical industry, as the equivalent associations on the Continent are able to do.

COAL FOR GENERATION

Some interesting views on the position of coal as a fuel for electricity generation were given by Mr. L. Rotherham, the C.E.G.B.'s member for research, when he delivered the tenth Coal Science Lecture to the British Coal Utilisation Research Association recently. Naturally, he also dealt with the principal competitors of coal, explaining, for example, how transport costs encouraged the use of oil in certain areas and how developments in "conventional" generating plant, coupled with a smaller rise in the price of coal than had been anticipated, had combined to retard the date when nuclear power would become truly competitive. Despite the incidence of these newer fuels, coal still holds pride of place on a quantity basis, accounting for some 84 per cent of the fuel consumed by all C.E.G.B. generating stations.

This figure is not constant, of course. In 1957 it was over 95 per cent and it is anticipated that by 1965 it may have fallen to 80 per cent. Despite this, a large requirement for coal is assured for several decades, and even if no further research work was carried out, the rising demand for electricity would suggest that coal consumption is unlikely to decline quantitatively during the next 20 years. Certain studies at present being made, however—notably on the hydraulic conveyance of coal, improved steam cycles and direct generation

devices—could, if successful, produce an increase in the consumption of coal to more than 100 million tons by 1970. This being so, there is every reason for the coal industry to encourage further effort in such research and development, and it might prove to be worth the Coal Board's while to take a direct part in this, particularly in the development of coal-fired direct-generation plant.

MANUAL WORKERS' STATUS

It is not always easy to justify the difference in the treatment accorded to "white collar" employees and manual workers. The basis is probably the greater likelihood of manual workers changing from job to job while the others do not move so frequently. Employers have found it easier in the past to dismiss hourly-paid employees when the work available falls off but now there is a drive towards greater security of tenure and compensation upon dismissal. Where employment is reasonably steady there is a good case for regarding manual workers, particularly the skilled ones, as "permanent" staff.

This view seems to have been taken by the Electricity Boards who have tentatively put forward proposals of this nature as an alternative to conceding their workers' claim for higher wages. Whether the trade unions concerned regard the proposals favourably will be known by the time this note appears as the discussions between the two parties were to be concluded yesterday (Thursday).

INTERNATIONAL STANDARDISATION

The variations in the colours of flexible connectors were mentioned by Sir Charles Colston in a recent letter to *The Times*. His purpose was to point to the difficulties encountered by British exporters by reason of the different requirements of different countries. The matter of flex was merely quoted as an example; Sir Charles also instanced the varying regulations governing the types of switches and fuses and their uses. He remarked how unfair it was that while this country applied no statutory restrictions, British exporters were compelled to comply with foreign regulations. There was no suggestion that we should impose restrictions: all that Sir Charles called for was an effort to achieve international uniformity of requirements.

Sir Charles suggested that British manufacturers would be more enthusiastic about the work of the British Electrical Approvals Board if it could, directly or indirectly, aid in achieving that uniformity of requirements. The British Standards Institution is the right body for this purpose and has long been active in the matter. The B.E.A.B., which already undertakes the testing of imported appliances, may consider direct action inappropriate, but no doubt it will be prepared to support the B.S.I. in this aspect of the latter's work.

NUCLEAR POWER IN BRITAIN

The 17th November issue of the *Electrical Review* will be devoted particularly to nuclear power developments. The present and future pattern of nuclear power will be described by an eminent member of the United Kingdom Atomic Energy Authority, and some aspects of the present and future power station construction programme will be discussed. The design concept of the advanced gas-cooled reactor will be dealt with in another special article; the technical description will include a specially-commissioned inset drawing in colour of the plant, which is now nearing completion

A Fifty-Year Retrospect

BACKGROUND TO THE B.E.A.M.A.'S DEVELOPMENT

In this brief survey of the history of the British Electrical and Allied Manufacturers' Association conditions in the electrical industry 50 years ago and today are contrasted and attention is drawn to some of the factors that have influenced the Association's development

LOOKING back through the pages of the *Electrical Review* of fifty years ago one is immediately struck by two things: the obvious advance in the design and appearance of electrical plant and apparatus and, less expected, the extraordinary similarity that often exists between the economic and commercial problems that the industry was struggling to overcome in 1911 and those with which it has been faced in recent years. Many paragraphs from leading articles, which appeared in the *Electrical Review* during the year that saw the British Electrical and Allied Manufacturers' Association emerge from the embryo National Electrical Manufacturers' Association, could be reproduced today with hardly a word changed as an appropriate comment on current conditions.

There are, for example, frequent references to the large number of exhibitions that manufacturers were called on to support, to the need for offering adequate long-term credits in selling heavy plant overseas, to the strength of competition from United States and German firms in Commonwealth markets, and the importance (this is a constant theme) for British firms to be more resolute in advertising their undoubted technical achievements. The *Electrical Review* was a staunch supporter of the British manufacturer and a sharp critic of those supply authorities that persisted in buying abroad and thus by implication undermined the faith of foreign undertakings in the quality of British plant. It is clear that the parallel cannot be drawn too specifically, but even when conditions in the two periods are not obviously similar there are many underlying trends and attitudes that can provide a useful stimulation when considering the solution of present-day problems.

The original work of Parsons, Ferranti and Crompton, to mention only three of the best-known names of the period, provides ample evidence of the technical achievements of British engineers during the first decade of this century. But the British electrical industry was failing to secure the rewards that this leadership should have provided. The position of the industry was neatly summed up by the late Emile Garcke in the 1910 edition of the *Encyclopædia Britannica*: "The normal posture of the British electrical manufacturer has been described as one

of desperate defence of his home market: that of the foreign manufacturer as one of vigorous attack upon British and foreign markets."

There were, it is true, some special factors to explain the weakness of the British electrical industry and these will be referred to later, but the underlying reason appears to have been a basic failure of manufacturers to adapt their methods and attitudes to changed conditions. British industry, and electrical manufacturers were no exception, had its roots firmly implanted in the industrial revolution, in the age of steam. Industry in the United States and Germany was less burdened by this weight of tradition and was ready and willing to invest in the new electrical techniques as these were developed from the end of the 19th century.

Industrial Development Abroad

In addition to this stimulus from home markets that were also protected by tariffs, the electrical industry in the United States and Germany benefited from local pressures that favoured the growth of large manufacturing units. In the United States the tendency was towards financial amalgamation, while in Germany amalgamation was encouraged by the state. The German Government intervened to co-ordinate industrial development and to protect it by carefully planned legislation. Manufacturers in these countries were thus in a strong position to meet the strong upward surge in demand. By 1911 several of the largest, including Westinghouse, Siemens and Brush, were well established in Britain where, despite British manufacturers' complaints of over-capacity, they saw scope for the development of, among other things, electric traction.

The development of the British electrical industry had been (and remains) more individualistic. Industrial and public opinion was unfavourable to trusts and viewed combinations of manufacturers with suspicion. Coupled with this, the British electrical manufacturer had no adequate and assured home market because of the effect of the Electric Lighting Acts in retarding the development of electricity supply and because under free trade they were without the protection afforded to their foreign com-



Former Directors of the B.E.A.M.A. Left to right: Mr. D. N. Dunlop, Mr. V. Watlington and Col. B. H. Leeson

petitors. Legislation, by threatening compulsory purchase, had encouraged electricity companies to seek immediate profit and buy their plant in the cheapest market.

The diverse requirements of the small supply companies made large-scale production and standardisation by British manufacturers impossible. Firms were driven to accept orders under the most adverse conditions. A pernicious system of tendering became common. Weakened by competition among themselves, it was natural that, in general, manufacturers were in no position to deal with their customers, with transport authorities and the Government.

Early Moves towards Co-operation

There was at the same time a growing appreciation among some of the more clear-sighted men in the industry that the practice whereby firms operated as discrete and unrelated units hampered development and that the lack of a common policy in the industry was a drawback in resisting the pressure of economic forces of all kinds and especially the growth of foreign competition. The first moves towards establishing a system of voluntary co-operation in the electrical industry had come with the formation of the Cable Makers' Association in 1899 and the Electrical Contractors' Association two years later. The National Electrical Manufacturers' Association was set up in 1902 and one of its first tasks was the drawing up of standard conditions of sales and contract "to prevent one customer playing off one manufacturer against another." But N.E.M.A., with 29 members mostly confined to the lighter side of the industry, a part-time secretary and no offices of its own, was not able to undertake the task which meant nothing less than "the reformation of the industry and a reorientation of its outlook, attitude and methods." Though some of the larger firms remained aloof, the idea of co-operation was nevertheless gaining ground and early in 1911 the *Electrical Review*, reporting the last annual meeting of the N.E.M.A., recorded that membership had doubled during the previous year and stood at over 80. By then much of the suspicion of the new organisation had been allayed and with the broadening of membership, the leaders of the Association felt able to revise its constitution and signify the widening of its activities by changing the title to the British Electrical and Allied Manufacturers' Association. The chief aim was "to foster some order and regulation in the trading of its constituent firms."

The *Electrical Review* of 20th November, 1911, had a warm welcome for the new Association. An inaugural dinner, presided over by Mr. (later Dr.) S. Z. de Ferranti,

the President of the Institution of Electrical Engineers, had been held at the Hotel Cecil the previous Thursday and, commenting on the speeches, the writer of the leading article said that the inauguration of the regenerated N.E.M.A. was "an event which must be regarded as one of the first importance to the electrical industry in this country." It was recognised that during the past eight or nine years N.E.M.A. had existed "without accomplishing any very notable achievements, except in matters of detail, and without leaving any very marked impression upon the surface of the industry; but its ineffectiveness was no doubt due largely to deficiency of means and lack of adequate support. . . ." Noting the wider basis and membership of the new body, the increased subscription and the new scheme for organisation and administration, the writer hoped that the Association "sets forth on its new career with vastly improved prospects of doing good work on behalf of its members, and great potentialities for the development of the British electrical and allied industries on sounder and saner lines than they have hitherto followed."

But the writer was disappointed that so little was revealed about how the B.E.A.M.A. was going to set about its task:—

"It was generally anticipated, we believe, that in his response to the toast of 'the Association,' the chairman, Mr. Nalder, would unfold to his expectant audience some outline of the policy and plans of the new body, but this assumption proved unfounded; not only Mr. Nalder, but Mr. Anderson and Mr. Hirst, who followed later, refrained most carefully from revealing the concrete intentions of the Council. Abstract declarations of determination to do great things for the allied industries there were in plenty, but nothing definite. The general impression left upon our minds, however, may be stated, viz.:—That the Council, while explicitly repudiating any intention of dabbling in fiscal questions, intends to exert its influence towards inducing purchasers of plant to place their orders with British manufacturers, and to mitigate as far as possible the severity of competition at present prevailing amongst the latter. These are most commendable objects—they are identical, in fact, with the policy that we have advocated in these pages for many years, and therefore command our most cordial approval and support. Our only regret is that no information was given as to the ways and means to be adopted by the Council. In the meantime, we must congratulate the Association upon its auspicious inauguration, and for the rest—in the words of one of the speakers at the dinner—we must 'Wait and see.'"

But it was probably unreasonable to expect too much immediately from what was after all no more than a paper decision. The real achievement had been to bring the different sections of the industry together. Energetic action was now needed to find a practical solution to the problem of attaining true co-operation without loss of individual liberty and without removing the stimulus of healthy competition. It was not an easy period. Fortunately the new Association was to have as its first director a remarkable man who had played a leading part in its formation and who had the great psychological advantage of coming from the powerful British Westinghouse Co. at Manchester. Mr. D. N. Dunlop was no ordinary business man. One of his obituaries described him as "a man of varied intellectual interests ranging from art and literature to economics, sociology and philosophy." His personality is clearly stamped on much of what the B.E.A.M.A. achieved during the 25 years that he led the Association. Coupled to a genius for organisation he had an extraordinary farsightedness. But his "vision" was far too clearly thought out and persuasive for any connection with the crystal ball. It would be fascinating to be able to hear some of the arguments that must have taken place between Dunlop and the more prosaic Council members of the time.

For Dunlop not only saw from the beginning the main lines on which a trade association must develop its services to members but he realised how the B.E.A.M.A. could help in the wider advance of the electrical industry. The B.E.A.M.A. appears often to have been too small a canvas for him. The culmination of his work came with the B.E.A.M.A. Council's sponsorship of the first World Power Conference in 1924. The profusion of international organisations today makes it difficult to appreciate the full contemporary significance of this pioneer essay in international co-operation between engineers.

During the post-war period the electrical manufacturers were in a confident mood with mounting demand at home and abroad for power equipment. The B.E.A.M.A. was active in running publicity campaigns for electrification in industry and the home and in 1920 they had joined with organisations representing all sides of the industry in founding the British Electrical Development Association. Other co-operative bodies in the formation of which the

B.E.A.M.A. took a leading part at this time were the British Engineering Standards Association (now the British Standards Institution and the British Electrical and Allied Industries Research Association. At the same time services to members were not neglected.

Commercial Policies

With the slump and the death of Mr. Dunlop there came a change of emphasis if not of purpose. The primary need was to help the industry out of the trade crisis and the B.E.A.M.A. was fortunate in that (as again after the war) they found a new director whose qualities suited the demands of the moment. Mr. Victor Watlington, who had earlier been a chairman of the Council, was a business man who knew the industry and the manufacturers' point of view intimately. It is significant that in 1938 the British electrical industry became the world's largest exporter of electrical goods. Mr. Watlington's strong commercial sense is revealed in an article he wrote for the *Electrical Review* the following year in which he devoted much space to the operation of the trade groups and to a justification of the industry's price policy.

These questions were to assume a major importance after the war when sections of the industry were subject to inquiry by the Monopolies Commission and later the Restrictive Practices Court. Although the B.E.A.M.A. itself is not concerned with prices it serviced the trade groups and their policies represented an essential part of the industry's thinking and governed its attitude to many economic problems. At the same time the manufacturers had to adjust themselves to the nationalisation of the supply industry and to a climate of opinion that was often unfavourable to electrical development. Thus, for much of the time that Col. B. H. Leeson was director, the B.E.A.M.A. was on the defensive. It is an outstanding tribute to his diplomacy and personal courage that he not only held the Association together during this difficult period but raised its status.

An important contribution in this respect was made by three outstanding essays in practical co-operation, the endowment of the Chair of Electrical Engineering at Cambridge, the launching of the B.E.A.M.A. Catalogue and the industry's stand at the Brussels International Exhibition in 1958.



A recent photograph of the B.E.A.M.A. Council in session

Reading from left to right around the table: Messrs. R. H. Fairfield, A. E. Skan, G. F. Davies, J. E. Belliss, E. W. Semmens, J. H. Ross, W. S. Steel, J. A. Crabtree, R. F. Archer, E. G. Plucknett, W. J. Bird, R. Berry, J. G. Milne, C. G. E. Parrott (of the B.E.A.M.A. staff), Lord Nelson of Stafford, Mr. S. F. Steward (B.E.A.M.A. Director), Mr. A. M. Browne (President), Viscount Chandos of Aldershot, Sir Kenneth Allen, Messrs. D. D. Walker, G. C. Stebbing (of B.E.A.M.A. staff), E. B. Banks, Sir Charles Westlake, Messrs. W. Glass, A. E. Grimsdale, S. Z. de Ferranti, A. H. Frampton, J. D. Morton, A. W. Browne, W. J. Barber, K. Rowell, C. A. J. Martin and J. H. Hall

B.E.A.M.A. AND THE FUTURE

In this article the Director of the British Electrical and Allied Manufacturers' Association presents his views on the functions of modern trade associations and outlines the policy and activities of his own Association, with particular reference to the promotion of export trade

By STANLEY F. STEWARD, C.B.E.



THE early history of the B.E.A.M.A. is being dealt with elsewhere in this issue, and I have already covered it in the paper presented to the British Electrical Power Convention at Eastbourne this year. My purpose in this article is to look forward rather than back, to consider the position of the electrical manufacturing industry in the national economy, and the role which will have to be played by its main trade association.

From almost the beginning of the century this Association has been in the centre of the affairs of the electrical industry, and has in fact been an integral part of it. The roots go back to 1902, when a group of electrical manufacturers and merchant houses formed the National Electrical Manufacturers' Association. In 1911 the membership and activities were extended, and the British Electrical and Allied Manufacturers' Association emerged.

The life of the B.E.A.M.A. spans almost the whole of the period of development of the electrical industry as we know it today, and it is perhaps significant that the manufacturing side of the industry has never been without this focal point for co-operation between its members. Through boom and slump, through two world wars, the basic services of the B.E.A.M.A. in such matters as electrical standards, research, technical training, exports, information, links with the Government and, above all, co-operation within the industry itself, have been maintained and developed to meet the needs of the times. We inherit, therefore, a great tradition and have a wealth of experience to guide and support our future plans.

The Association and the Industry

The fundamental purpose of a trade association must always be to safeguard and promote the interests of its members. In the case of the B.E.A.M.A. our membership covers such a high proportion of the whole electrical manufacturing industry that it can be said that what is good for the electrical industry is bound to be good for the B.E.A.M.A. members.

We are living in complex and competitive times and all the evidence indicates that the complexity and competition is likely to increase in the years ahead. There is no doubt in my mind that the over-riding duty of the B.E.A.M.A. in the future will be to ensure that Britain's electrical manufacture is both progressive and prosperous. Unless we are really progressive we shall not hold our leading position against world competition and unless we are prosperous we shall not be able to provide the technical and financial resources to support the research and

development, the modern equipment and vigorous selling which our key position in the economy demands.

For electrical manufacture is a key industry in every sense of the word. There is hardly an aspect of our national economy which does not depend on electric power and electrical equipment at some stage. Electrical manufacture supplies more than one-third of the capital equipment of the country, including plant for power supply and electrical machinery and electronic apparatus for industry, transport, communications and defence. Our industry now supplies about £1,600 million of electrical and allied engineering products annually, and exports are already running at a rate in excess of £300 million a year.

A Developing Organisation

It is against this background and with a sense of our national responsibility that we in the B.E.A.M.A. have been looking to the future. Because of the wide spread of the industry, and the differences in products, ranging from industrial electronic devices and domestic appliances on the one hand to electric locomotives, turbines and heavy electrical plant on the other, the B.E.A.M.A. is not so much a trade association in the ordinary sense as a federation of trade associations, each dealing with important product groups, but all having as a common purpose the progress and financial success of electrical manufacture.

The organisation of the B.E.A.M.A. is based on its Sections, each concerned with a particular product group, and all drawing on the common services provided by the Overseas Division, Information Division, Standardisation Department, the Legal Department and other central departments. This basic organisation is likely to remain, as it ensures that in such matters as standardisation, export promotion and representations to the Government, the special experience and needs of different sectors of the industry are taken fully into account.

The growth of the industry and the importance of the issues which arise are placing an increasing burden on the B.E.A.M.A. Council, and with this in mind, and to ensure that leading personalities in each main sector of the electrical industry are able to influence and guide its policy, a pattern of separate and largely autonomous Boards is emerging. The first of these was the Domestic Appliances Board, set up in 1959 to co-ordinate the policy of the six separate Sections in this field (now seven Sections) and to speak with authority on behalf of the whole domestic appliance industry.

A more recent development has been the establishment

of the Electronics Board, charged with the duty of acting on behalf of the Council over the whole field of electronic engineering in the interest of the B.E.A.M.A. members concerned.

Already the several turbine and allied plant Sections are working together, and a Joint Policy Committee has been established to serve both the Small Switch and Fuse and the Accessories Sections. In addition, of course, the Council is well served by certain main committees such as the Export Panel, the Standardisation Committee, the Publicity and Exhibitions Committee, and the Education and Training Committee, all of which are able to deal authoritatively with matters in their respective fields.

I think there is little doubt that this pattern will develop naturally and in accordance with the particular needs of the main sectors of the industry, leaving the Council, consisting as it does of the recognised leaders of the industry, to concentrate on matters of major policy.

Representations to Government

There are many such matters at the present time. With the growing impact of Government policies on industry it has become increasingly necessary for the B.E.A.M.A. to make representations to the Government at a high level in order to safeguard the stability and prosperity of different sectors of the electrical industry. These are matters where appeals by individual firms are ineffective and on which the whole weight and authority of the Association must be brought to bear.

It is, for instance, a cardinal point of B.E.A.M.A. policy that a stable home market is essential if electrical manufacture is to be efficient, progressive and prosperous and if it is to increase its already high contribution to our exports. In recent times our industry has suffered severe setbacks as a result of the Government's "start-stop" economic policies. The domestic appliance sector is particularly vulnerable to the unpredictable application and release of the hire-purchase "brake." The B.E.A.M.A., in conjunction with its Domestic Appliances Board, made a number of representations to the Government on this issue and produced incontrovertible evidence of the damage done to exports by the violent fluctuation in hire-purchase policy. This culminated in a meeting with Mr. Maudling, then President of the Board of Trade, as a result of which he was able to assure us that he recognised that changes in the level of control, whether up or down, constituted a dislocating factor in the industry's plans and he hoped that the Government had now achieved a reasonable set of rules which could be maintained for some time.

A reflection of these representations was seen in the Chancellor's speech in introducing the new economic measures when he made it clear that the Government preferred to introduce its economic regulators over the whole field rather than continue to pick out growth industries, such as domestic electrical appliances, for severe treatment. We still hope, when times are more propitious, to persuade the Government that the right level of hire-purchase deposit for domestic electrical appliances is 10 per cent, as the present level is imposing too great a restraint on the purchase and use of these important labour-saving devices.

The Association was equally concerned with the uncertainties arising in the electric traction field following the hold-up by the Government of the railway modernisa-

tion plans. Here again, representations were made to the President of the Board of Trade and the Minister of Transport, as well as in evidence to the Stedeford Group, stressing the absolute dependence of our export trade in this field on the continuity and success of British Railways' electrification plans. The release of the scheme to complete the electrification from Manchester and Liverpool to Euston was welcomed by the industry, but the uncertainty about the future arising from the reorganisation of the British Transport Commission and the financial problems involved is still a matter of concern.

Then there is the future of the electricity supply programme, a matter of quite major national importance at the present time. Because of the close interdependence of the electrical plant manufacturers and the electricity supply industry we have recently made representations to the Chancellor of the Exchequer, the President of the Board of Trade and the Minister of Power, pointing out that, as abundant electric power is a key factor in the country's economic growth, it is essential that there should be an adequate and stable long-term investment programme for the electricity supply industry. It is evident that the growth of electricity demand exceeds earlier estimates and we have pointed out that any reduction or "re-phasing" of the required long-term generating plant programme and the programme of the Area Boards, whilst doing nothing to ease the Chancellor's short-term problems, would carry a grave risk of power shortage a few years hence and jeopardise the country's industrial recovery and economic growth.

Export Challenge

The constructive and friendly relationships between the supply and manufacturing sides of the electrical industry have always been a great source of strength to the industry and to the country. This is, of course, of special importance in the field of large generating plant where there is only one purchaser in the home market and where export success is inseparable from the technical progress and certainty of the home programme. The recognition by the nationalised supply industry of a broad responsibility for the well-being of electrical manufacture in the interest of export trade is essential if we are to meet the challenge of the European Common Market and international competition without being at a disadvantage with our Continental competitors. A practical demonstration of this common purpose was provided by the participation of Mr. F. H. S. Brown, deputy chairman of the Central Electricity Generating Board, in our recent Export Conference when, in the course of his paper, he pointed out that in the manufacture of heavy generating and transmitting plant export business could be based only upon a home market, and the C.E.G.B., as virtual monopoly buyer, was conscious of the responsibilities which such a position carried.

The fact that the electrical manufacturers provide about 10 per cent of our exports of manufactured goods, and plan to do more, places a special responsibility on the Overseas Division of the B.E.A.M.A. It must, however, always be remembered that a trade association cannot provide a substitute for enterprise and initiative by its individual members. Our duty is rather to establish the most favourable climate in overseas markets, to find out all we can about market possibilities and problems, and

to secure the active co-operation and support of the Government in our industry's export efforts.

The B.E.A.M.A. Export Panel, consisting of leading specialists on export matters, guides the Association's policy in this field and maintains liaison with the Overseas Committees which have been established in nine major territories. The Information Division provides economic information, statistical and public relations services to back up these efforts in the overseas markets and works closely with the Board of Trade, the Central Office of Information, the Overseas Services of the B.B.C., news agencies and overseas journals to ensure that there is continuous publication throughout the world of news and comment on the achievements of the electrical industry. This work is now being supplemented by the B.E.A.M.A. Export Directory and Buyers' Guide, with a reference section in five languages, including Russian, 15,000 copies of which will be distributed overseas next month.

European Market

For the third year in succession the Association is co-operating with the Board of Trade in staging a collective exhibit of domestic electrical appliances at next year's International Household Goods and Hardware Fair at Cologne. The success of this venture is shown by the fact that it has increased in size each year and that firms who have participated have found it has enabled them to break into the European market in a way which would not otherwise have been possible. The whole question of the European market is now providing an important part of the work of the B.E.A.M.A. Last year we produced our survey of the Common Market for electrical products which was the first of its kind to be undertaken by a trade association and we have followed this up in our *Bulletin* to members by giving detailed information on the market potential in separate countries in Europe. Our links with the other engineering trade associations in Europe have been established for some years through ORGALIME, and these have proved invaluable during the period of discussion leading up to Britain's application to join the Common Market and will be of immense value to our members as we become more and more involved in the European economy. If Britain joins the Common Market it will be the policy of the B.E.A.M.A. to try to secure equality of opportunity for our manufacturers to compete with Continental firms and also to safeguard and foster our industry's all-important trade with the Commonwealth.

In this event it will be necessary for the Association to establish close links with the administration of the European Economic Community in Brussels so that the information available to the British electrical manufacturers is as complete and up-to-date as that of their Continental competitors.

The Future

All these matters represent a substantial programme of activity by the B.E.A.M.A. on behalf of its members in the years ahead, but we shall not succeed unless we can continue to maintain and foster in the electrical industry the trust and co-operation between its members which provided the foundation for the progress and expansion of the industry over the last 50 years. In speaking about the B.E.A.M.A. at last year's Convention, Sir Josiah Eccles paid a tribute to our work of "promoting co-

operation in a society of individualists." This is the real task of a trade association under modern conditions. We have to preserve to the full the private enterprise and initiative of every electrical manufacturer, but we have also to provide the means by which members of a great industry such as ours can work together in the common interest.

The accounts of the leading electrical manufacturing companies have disclosed that, in general, the profit margins and the return on the capital employed have been falling steadily during the last few years, and in some cases have reached a dangerously low level. This is because of the need to spend large sums to maintain our lead and also because the highly competitive conditions of recent years have put profit margins under severe pressure. If our electrical industry is to continue the investment and research necessary to maintain its leading position in the world—if it is to be well equipped to succeed in the hurly-burly of the European market—then it must be in a position to secure its full measure of profitable business. The financial status of the electrical industry is a matter of great importance, and a period of excessive price warfare, with inadequate margins, could deter investment and produce a dangerous situation from a national point of view.

One of the chief causes of excessive price warfare and unstable trading conditions is lack of reliable information. Ignorance of such matters as prevailing price levels and costs, the general trend of inquiries and orders and the existing capacity to produce, can and does distort judgment and hamper long-term planning. Without up-to-date and accurate information, competing firms can waste their own and the community's resources by over-investment or by ill-directed investment, by price-cutting and other short-sighted methods of securing temporary advantage in difficult times. The interchange of information between firms in the same industry under conditions of trust and confidence can go a long way towards securing stable trading conditions and the best use of productive and technical resources.

National Planning

The electrical industry represents too vital a sector of the national economy to allow its capital investment, technical developments and commercial activities to be entirely unplanned and unco-ordinated. Because of this the B.E.A.M.A. welcomes the Government's desire to introduce industrial planning on a national scale. It is our hope that any planning organisation will be as close to industry as to Government, and a servant of both, so that, in a key industry such as ours, programmes and plans will always be directly related to the information and projections provided by the industry itself.

The collection and dissemination of statistics and information on an industry basis, the study of market trends and overseas competition, and the organisation of inter-firm comparisons are likely to form a major part of the work of a modern trade association.

The services and facilities provided by the B.E.A.M.A. in this field will form the basis of co-operation in the electrical manufacturing industry in the years ahead and help to ensure that the industry is in a position to make its full contribution to the economic growth on which Britain's future depends.

VIEWS on the NEWS

By "REFLECTOR"

AFTER reading an *Observer* article on the new China I wonder why so much is made of transformer manufacture when Chinese peasants take it in their stride. It seems that a long-distance power line was built across a commune but the inhabitants were told that they could not be connected to it because no transformers were available.

"So they sent one of their members into town to borrow an electrical handbook from a technical library. For nights they pored over this manual, trying to understand how a transformer works; then they went ahead and made one, using old wire and pipes and odds and ends they picked up or bought secondhand. The power engineers came out to see it. It didn't look much of a transformer but they hooked it up, and it worked. When the story got around a number of neighbouring communes in the same fix put in orders. But this time the Party, having got word of this example of local initiative, sent down a man with blueprints. From then on the commune was in the transformer-making business."

* * *

At Burnley (Lancs) electricity is not only superseding gas: it is taking over some of its rival's gear. "Area Topics" (the North Western Electricity Board's magazine) reports that thousands of yards of old gas piping buried beneath the town's maze of streets for decades is becoming part of a new lighting system. The street lighting superintendent has explained that

"Running a special electricity cable through the underground gas pipes saves taking up a whole street. But for this method, some back streets would be left with gas lighting, because we would never attempt to dig them up."

I trust that the cables running in these pipes will be able to withstand the effects of the deposits which the gas must have left over the decades—or are the pipes cleaned out first?

* * *

Thefts of electric cable in England are sordid incidents. And so they are in Scotland, I suppose, but I have seen a report in the *Stirling Journal* of a case in which a metal merchant "pled guilty to resetting 421 lb of electric cable, the same having been dishonestly appropriated by theft." The Scots' legal phraseology seems to make it different from ordinary stealing.

* * *

Tea drinking is causing more trouble in industry today than alcoholism, apparently, and that trouble appears to have spread to the War Office, if the daily Press is to be believed. It seems that "snoopers" from the Ministry

of Works have been searching the War Office for privately-owned electric kettles. The *Daily Sketch* says:—

"They found one or two. And the Ministry of Works laid it down that using private kettles caused a fire risk and used up Government electricity unofficially. The rule is that War Office employees are not allowed to brew up unless they are working late, and then they must use Government-owned electric kettles."

The latter, presumably, having received B.E.A.B. approval.

* * * * *

Whatever they may claim for their commodity, there is a definite smell about the oil companies' heating propaganda. In the newspapers and on television they are persistently claiming that the cost of domestic heating by oil is about half that of electric heating (with gas somewhere in between). Although in their advertisements they say "Look at the facts," there is no indication at all of how their extraordinary figures are derived. And, of course, the rather delicate matter of installation cost is overlooked, although a five-year repayment period is mentioned. It all makes me ask with the lady who wrote to the *Observer*: "Shall we have to endure the radiator smile of Mrs. 1970 until 1970?"

* * * * *

I think I may have discovered the source of the oil companies' electrical figure. The *Derby Evening Telegraph* says that the East Midlands Electricity Board has asked it to point out that the special low tariff for electric floor warming is 3d a unit and not 3s 4d as stated in a previous edition.

* * * * *

A bright idea of 80 years ago does not appear to have been pursued. A Professor Blyth, opening an evening science lecture course in Glasgow, was reported by the *Electrical Review* of 1st November, 1881, to have said:—

"The electric light had so dazzled our eyes and filled our heads that there seemed to be little room left for seeing or considering other methods of converting mechanical work into heat and light through the agency of the electrical current. One such method in particular had been very strangely ignored—the method of lighting by the oxy-hydrogen light, where the gases are supplied by electrolysis. There seems to be no reason why our waterfalls and sources of power should not be used to fill gasometers with the separate or mixed gases oxygen and hydrogen, and then these led, like ordinary gas, to produce the brilliant oxy-hydrogen lime-light, or in some cases to produce for useful purposes the intensely hot oxy-hydrogen flame."

COAL AND POWER

THE British Coal Utilisation Research Association's tenth Coal Science Lecture was delivered in London on 11th October by Mr. L. Rotherham, the member for research of the Central Electricity Generating Board, who considered the position of coal in electricity generation. He said that coal accounted for about 84 per cent of all fuel consumed by the C.E.G.B. stations, but in 1957 the figure was over 95 per cent and by 1965 it might fall to 80 per cent.

There was a steady increase in load and maximum demand, while the number of kWh sold increased at a slightly faster rate as the annual load factor improved. The consumption in areas adjacent to London and the south coast tended to increase at a rather higher rate than in the northern areas near to the coalfields. It was in these southern areas and also in the high coal cost area in the North Western Region of the Generating Board that oil had made inroads into the position of coal as the dominant fuel for power generation. One reason for this was that oil was more readily transported than coal, and research on fuel transport could help coal to regain its position. Oil also had a lower impurity content and was more readily handled, leading to lower capital costs for oil-burning stations which had to be offset by a difference in the basic price of the fuel.

Nuclear Energy Competition

Coal also had to face competition from nuclear energy. So far the early predictions of the fall in capital cost of nuclear stations had been justified and although at present they were uneconomical compared with coal-fired stations it seemed that the total costs of generation would move in favour of nuclear energy. However, the date when nuclear energy would become truly competitive had been postponed for several years, not because predictions on nuclear development were wrong but because the rise in the price of coal had been less than had been assumed, while thermal efficiency had been progressively improved and capital costs had fallen. Progress in the development of conventional plant had been more rapid than had been assumed in the early days of nuclear energy and if this could be maintained the date of the large-scale installation of economic nuclear power might be still further delayed.

The price of coal at the pithead of the best collieries was competitive with oil prices but transport costs were high and favoured oil in certain areas. The merits of transmitting electricity compared with moving fuel in other forms had been studied and it seemed likely that other means of transport had advantages in some circumstances. The use of d.c. transmission and hydraulic transport of coal were being investigated in detail.

Ash in coal was a serious nuisance, he said, but at a price the ash problem could be dealt with. One aspect of the problem had been dealt with at the B.C.U.R.A. under the auspices of the Boiler Availability Committee. This work would be continued by studies of the deposition and attack of the waste products of combustion on boiler parts. One approach had been the development of slagging combustion systems intended to collect and remove the ash before it could come into contact with the boiler

tubes. If this could not be done, any ash should be carried through the boiler if possible and collected before discharge to the atmosphere.

Mr. Rotherham finally dealt with some engineering developments now being undertaken. The cost of fossil fuel power stations had fallen and at the same time the thermal efficiency had risen at a rate greater than had been anticipated only a few years ago. It was sometimes overlooked that increases in thermal efficiency required the use of more sophisticated designs and more expensive materials and the extent to which the marginal increases in capital costs implied by this were justified depended on the cost of fuel. If coal were a comparatively cheap fuel as was uranium, for example, marginal increases in thermal efficiency would be unnecessary and a further reduction in capital cost would have to be sought. However, since coal was relatively expensive, thermal efficiency improvements had had to be developed. In part, they could be obtained by research and development on the increase of steam temperatures and pressures, and the C.E.G.B. had ordered supercritical units for the Drakelow "C" power station. In addition, work was being continued on more advanced steam conditions and on the Field cycle as an alternative thermodynamic system to the Rankine cycle. It must also be noted that work on direct generation devices such as the fuel cell, thermionic and more particularly magnetohydrodynamic generators was best regarded as a means of improving thermal efficiency and that efficiencies in excess of 50 per cent might be achieved. Some of these more advanced methods might be easier to devise using refined fuels, but the National Coal Board might well wish to help in the development of coal-fired direct generation devices.

Plug and Socket Specification

THE revision of B.S. 196 includes the developments which have come about since the last edition of the standard was published in 1930. The new edition deals with protected-type non-reversible plugs, socket-outlets, cable-couplers and appliance-couplers with earthing contacts, for single phase a.c. circuits up to 250 V. The accessories are given for ratings of 5, 15 and 30 A, and in all cases a non-reversibility pin is included. Details are also given for both single and double-pole fused plugs for use on ring and looped circuits. A full range of accessories with pilot contacts is also included.

Details are given of a system of keys and keyways in plugs and socket-outlets to ensure that socket-outlets or connectors will not accept plugs intended for use with a different voltage or a different frequency of supply or incorrect fusing arrangements. Full dimensions for interchangeability are given for plugs and socket-outlets with and without pilot contacts.

Separate sections specify detailed requirements for the construction of plugs, appliance-inlets, socket-outlets and connectors, and also for the tests applicable to all these accessories.

Copies may be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 15s each.

Generation at Drakelow



OFFICIAL OPENING OF 480 MW "B" STATION

THE second of the three generating stations in the Central Electricity Generating Board's plan for the development of the Drakelow site, near Burton-on-Trent, was officially opened last Friday by the Lord Lieutenant of Derbyshire, Col. Sir Ian Walker-Okeover. The first was completed in November, 1955, and contains four 60 MW units, and the second also has four units, but of double this capacity. The third station is now under construction and this is planned to have two 350 MW and two 375 MW units. When this is completed the site will have an installed capacity of 2,170 MW, the largest concentration of generating plant in Europe. Both the "A" and the "B" stations have been operating on base load, but it is possible that the smaller station may shortly be considered for two-shift working. The "B" station has been operating with an average thermal efficiency of 33.6 per cent, a figure which has been improved upon only by Blyth "A" and Agecroft "C" with 34.11 per cent.

The four Parsons 120 MW turbo-generators in the "B" station are numbered from 5 to 8 to follow in sequence on the smaller sets in the "A" station, a practice which is being continued with the "C" station, with units 9 to 12. Each turbine is supplied with steam at 1,500 p.s.i. and 1,000°F at the turbine stop-valve, reheated to 1,000°F at 360 p.s.i. at the intermediate pressure cylinder inlets, by a single-drum boiler with an evaporative capacity of 860 klb/hr when supplied with feed water at 435°F at the economiser inlet. The boiler for No. 5 unit was supplied by International Combustion, Ltd., the other three being of Foster Wheeler, Ltd., manufacture. The instrumentation and control system for all four units has been supplied by Electroflo Meters, Ltd. Television equipment has been installed to observe drum water level and combustion chamber conditions, the flame position

affecting the temperature obtained. Some difficulties have been encountered with the latter during coal firing owing to soot and ash build-up, but it is always used when the furnace is being started on oil.

A mixed flow circulating water system has been employed, interconnected with that of the "A" station, so that condenser cooling water can be drawn direct from the River Trent or from the two 3.82 million gallons of water per hour towers, or both, depending on the station load. Fuel consumption averages 5,600 tons of coal daily, of calorific value between 7,800 and 11,500 B.Th.U/lb.

Each generator is connected to a 13.8/295 kV, 125 MVA transformer, the machine being switched and synchronised at 275 kV. Two units are controlled from each of the two plant control rooms in the auxiliaries' bay, the main electrical control room for the "A" and "B" stations being in the common administrative block between the stations.

Since the "A" station began operating at the end of 1954, the ash content of the fuel has increased from 12 to 20 per cent and this has resulted in three mills per boiler

THIS STATION WAS ORIGINALLY DESCRIBED IN OUR ISSUE OF 18 DECEMBER 1959

Other stations under construction which have been described in articles specially prepared by our technical staff since that date are as follows:

Ffestiniog	26/2/60	Aberthaw	24/2/61
Northfleet	26/8/60	Staythorpe 'B'	
Spondon 'H'	9/12/60	Uskmouth 'B'	
Belvedere	30/12/60	Skelton Grange 'B'	19/5/61



Turbine hall, showing No. 7 set in the foreground

normally being used, although one was originally intended as standby, and the use of larger ash pump impellers and motors and modified crushers. The ash and dust is used to reclaim gravel pits within the site, which are being worked at about 10 acres per year, after which the top soil is replaced. This is expected to continue for nearly ten years. In addition, dust from the "B" station is being pumped to gravel pits on the opposite bank of the river. Three permanent lagoons are now being constructed, each of 300,000 tons capacity, which can be filled and the ash subsequently re-excavated and removed from the site.

Considerable work has already been carried out on the "C" station, including foundations, culverts and steel-work. A feature of this station is that construction started

in the centre, principally because of the position of the control room. No. 10 set is due for commissioning first, followed by 9, then 11 and 12. Unlike the "A" and "B" stations, these sets will be situated transversely in the turbine hall. One group of three cooling towers, each tower of 6.6 million gal/hr capacity, will be built at each end of the station and these will provide all c.w. cooling, make-up water only being taken from the river. A separate coal plant will be built, together with over ten miles of sidings, in which bottom-opening wagons will pass continuously over the ground hopper. When it is completed, this third generating station at Drakelow is expected to have an overall thermal efficiency of between 39 and 40 per cent.

BRITISH NUCLEAR ENERGY SOCIETY

ON 1st January, 1962, the British Nuclear Energy Conference will be replaced by the British Nuclear Energy Society. The Conference was established in 1955 by the Institutions of Civil, Mechanical, Electrical and Chemical Engineers and the Institute of Physics. The board of the Conference feels that the time has now come to provide a central forum for the discussion of nuclear energy.

Membership of the new British Nuclear Energy Society will be open on application to members of all classes of the constituent societies of the British Nuclear Energy Conference and to all who satisfy the board that they are "actively engaged in the professional, scientific, or technical aspects of the application of nuclear energy and ancillary subjects." The Institution of Civil Engineers have made their premises in Great George Street, Westminster, available as a meeting place and a regular programme of papers, lectures, symposia and informal discussions is being planned.

The Society will publish a quarterly journal, the first issue of which will appear in January, 1962. Application forms for membership can be obtained from the Secretary, British Nuclear Energy Society, 1-7, Great George Street, London, S.W.1. The annual subscription will be £2 10s.

POWER REACTOR EXPERIMENTS

THE International Atomic Energy Agency is holding a five-day scientific symposium on "Power Reactor Experiments" in Vienna. Nearly 200 experts from 21 countries and two international organisations are participating in the symposium, which ends today, Friday. Some 30 papers are being presented and discussed. The symposium is devoted to a discussion of advanced reactor systems, including their technical features, experimental experience thus far obtained, and an appraisal of future trends.

SCIENTIFIC INSTRUMENT MANUFACTURE



Cambridge Instruments Build New Factory

A NEW instrument assembly wing has been added to the Chesterton Road works at Cambridge of the Cambridge Instrument Co., Ltd., and on Monday last these premises were officially opened by Sir Keith Joseph, Minister of State, Board of Trade. This new wing is a clean functional building with two raised storeys beneath which there is a ground-floor level car park. The building blends harmoniously with the research laboratory and entrance hall (opened two years ago) to which it has been planned as a logical architectural extension.

After the opening ceremony had taken place we had the opportunity of visiting the research department as well as the new wing. The mechanical laboratory of the research department is where the design and manufacture

of mechanical components for projects under development in the other laboratories is carried out. Research is also in progress on the conversion of electrical into pneumatic signals (and the converse) for automatic control purposes; new designs of galvanometric recording, indicating and controlling instruments; vibration studies of instruments and the measurement of vibration generally; and improvements in the design of microtomes.

Although the physics laboratory deals with research into physics on a broad scale, particular emphasis has lately been laid on electronics research concerned with electrocardiographs and other medical instruments, X-ray microanalysers, and recorders and controllers. In addition to the main laboratory there is also a room in which accurate electrical measurements are made and a small workshop.

The work of the chemical laboratory is concerned mainly with the design of instruments for continuous chemical analysis of liquids and gases. In the case of liquids, analysis of boiler feed water (including the presentation of up to six analyses on one chart) and polarographic analysis and its applications, are of most concern at present. In gas analysis, applications of katharometers (thermal conductivity meters) and combustion analysers are being studied and work has also recently started on gas chromatography with special reference to permanent gases—the detectors for this, however, are likely to have applications in all forms of gas chromatography.

The New Building

The two raised storeys provide a working area of 15,000 sq ft fronting on Carlyle Road at right-angles to and behind the entrance hall. At the other end of the new wing a two-storey link block containing a lift, stairs, and toilet facilities, connects it to other works buildings.

The two-thirds of the first floor area nearest to the entrance hall is taken up by offices, while the remainder is occupied by the microanalyser department. The whole



Testing a Microscan X-ray analyser



General view of the test room and galvanometer mounting department

of the second floor area is used as a workshop for instrument assembly and testing. Both of these production departments are connected by air locks to the link block containing the stairs and the lift. All windows are double glazed and the air supplied throughout the building is conditioned and filtered. Essential services (ventilation and heating inlets, gas, compressed air, water, electrical services, telephones, etc.) are laid in horizontal floor ducts and (to reduce fire risks) all work benches are wired with mineral-insulated metal-sheathed conductors. Two penthouses on the roof contain the air-conditioning plant.

In the production department there is a section concerned with the assembly and testing of electronic instruments, and associated components, the work consisting primarily of small batch production and the manufacture of prototypes. To reduce the physical dimensions of instruments, and components, much use is made of printed circuits and semiconductor devices. Instruments and components passing through the department include: electronic components for the Microscan X-ray analyser,

electrocardiographs, dye-dilution curve-recording equipment, amplifiers for pressure transducers, amplifiers for polarographs, extrusion speed transmitters, etc.

In another department a comprehensive range of gas analysers of the thermal conductivity type are in production, including instruments for flue gas analysis, the determination of the purity of rare gases, occluded hydrogen in metals, etc. Indicators, recorders, and controllers for use with meters analysing explosive or toxic gases are also produced. The department is also responsible for the assembly and calibration of instruments for the measurement of the dissolved oxygen content of boiler

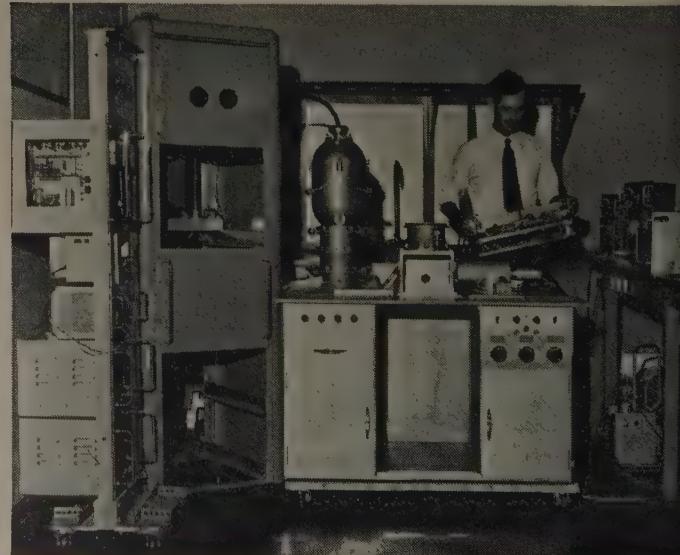
feed water—by the very sensitive electrochemical gas transfer methods—and meters for determining the oxygen content of gas mixtures—by measuring the mixture's paramagnetic properties.

In the new wing the micro-analyser department is responsible for the assembly and final testing of all Microscan X-ray analysers and for the production of sealed and flow type proportional counters. The department is also concerned with the commissioning and servicing of Microscans and operates an advisory service, including the analysis of samples provided by potential customers. The instruments are assembled in adjacent cubicles, each of which is supplied with its own special services. To provide the very high standards of cleanliness required, the air supplied passes through an additional filtration stage before being circulated. On the floor above and under almost clinically clean conditions, groups of galvanometers, indicators, recorders, and controllers are assembled, tested, calibrated and packed into polythene containers ready for dispatch.



Left: Vibration testing a new instrument

Below: Experimental work on an improved scanning electron microscope



Summary of the author's inaugural address as chairman of the Supply Section of the Institution of Electrical Engineers which was delivered at a meeting on 18th October



Fig. 1.—Central Electricity high voltage laboratory at Leatherhead

RESEARCH AND TRANSMISSION

By J. S. FORREST, M.A., D.Sc., M.I.E.E.*

THE development of the electricity supply system in this country provides the basic background for transmission research. Broadly speaking, the transmission voltage has had to be doubled every 20 years to enable the system to handle the increased load, and research should be started at the next higher-voltage step about ten years before this voltage is required for service operation. Accordingly, facilities have now been provided by the Central Electricity Generating Board for research on 600/700 kV systems.

The use of very high voltages makes it necessary to control the voltage gradient on the surface of conductors and fittings in order to minimise corona power loss and radio interference. Fortunately, by using "bundle" conductors, the surface gradient can be reduced to such an extent that power loss and radio interference do not present serious problems even at the highest voltages contemplated at present.

The increase in load-carrying capacity of transmission

lines resulting from the use of high voltages and bundle conductors is quite remarkable. For example, a 400 kV line with quad conductors will carry about 25 times as much load as one of the original 132 kV grid lines.

The mechanical design of overhead lines presents many important problems. For example, the conductor spacers which are used to keep the individual conductors of a bundle at the proper distance apart have given rise to a great deal of unforeseen trouble. Accordingly, a machine has been built to subject a spacer to the movements experienced in service, but at a higher repetition rate, in order to obtain data quickly on the likely behaviour of a given design on a line. This machine is now being used to select replacement designs and to determine the relative endurance of new designs.

The present method used for the design of foundations for overhead-line towers is based on empirical assumptions which are rarely borne out in practice. Accordingly, when an existing line has to be removed, the opportunity is often taken to test the foundations to destruction in order to obtain factual information on their strength, with the

* Director, Central Electricity Research Laboratories, Leatherhead.

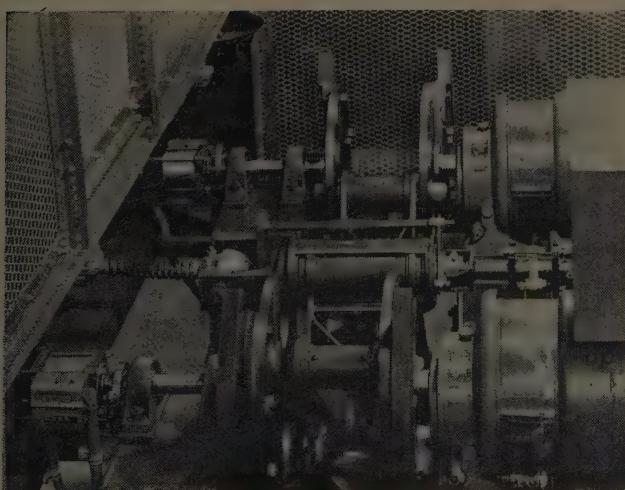


Fig. 2.—Machine for testing overhead-line conductor spacers



Fig. 3.—Investigation of strength of tower foundations

ultimate object of deriving a more precise method of foundation design.

The insulation of high-voltage lines and equipment under humid conditions in industrial and coastal areas presents a difficult problem, and research has been in progress for many years with the object of developing the most efficient types of insulator. This work has led to improvements in performance and to the formulation of various design criteria, such as the minimum leakage path of 1 in per kV , which are now generally adopted.

The extension of transmission systems is necessarily

based on an extrapolation of existing technology, but widespread changes could arise in the future as the result of developments in materials. For example, a new discovery has been made recently in the Bell Telephone Laboratories which brings the practical application of superconducting materials much closer. Alloys have been discovered in which the superconductivity is not destroyed by a magnetic field. Very high current densities without copper losses can be achieved and if the refrigeration problem can be solved economically, superconducting cables and transformers present attractive possibilities.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

“Mixed” Socket Outlets

AS a builder I was naturally very interested in what Mr. Brealey had to say regarding the above (*Electrical Review*, 13th October) and I gather his protest was, first, against a three-socket outlet unit on a basis of non-interchangeability, it comprising one 13 A and two 2 A outlets. He learned that Mr. Everitt (*Electrical Review*, 6th October) is using these units intelligently, for he congratulates him. Twenty-two extra outlets for a total cost of £12 10s installed, but Mr. Brealey doubts if others will follow suit.

Mr. Brealey's next attack is the method of fixed prices for extra outlets and suggests that a charge based directly on cost would permit careful siting of socket outlets. How little he must know of the problems of the builder and the electrical contractor in relation to public demand.

I presume we are talking about estate houses, already erected and offered for sale, and not houses designed to individual specification. It is my experience that not until the house is almost completed does the purchaser think about the number and position of outlets, and any late alteration is expensive. A fixed price or on-cost price is of little matter to the purchaser who will still be faced with a considerable outlay for additional 13 A points; or does Mr. Brealey suggest that builders should just construct the main walls of a house and leave them standing until a purchaser has signed a contract and decided what outlets he requires?

My electrical work goes out to competitive tender and in consultation with the electrician I plan as intelligently as I am able, and in my opinion the kitchen worktop, the firesides and bed-sides are positions demanding multi-units, and I have frequently used the very type complained about.

Can Mr. Brealey suggest a better alternative to an inexpensive unit about which he protests, which, while still retaining its power outlet, gives two additional outlets safely housed and fused, employing small inexpensive unfused plugs to control such items as standard, table and bedside lamps, radio sets, television, electric blankets, alarm clocks, record players, tape recorders and even Tommy's train, and countless other electrical gadgets which make up the modern home, thus preventing the use of often dangerous adaptors, or do-it-yourself adaptations?

Now, coming to Mr. Brealey's final rub: “The builder

strictly could have charged £10 10s for each mixed outlet,” the point strictly is—he did not. Or should I end—oh, really Mr. Brealey, you are over-specialised.

London, N.21.

L. R. LOWRIE.

Mr. Stewardson (*Electrical Review*, 20th October) obviously is not familiar with the triple fireside unit used by Mr. Everitt. Throughout my house I have many of these units, some of which, under the name of “Newday,” were installed ten years ago. The two 2 A three-pin outlets are protected by a 5 A fuse and, furthermore, also protected by this fuse, is a spur to which can be connected a further 2 A three-pin socket, and this arrangement is fully covered by the I.E.E. Regulations.

I am constantly puzzled by the reluctance of architects and others to use these very excellent outlets, particularly as the majority of portable equipment does not require anywhere near 2 A, and the small plugs are very much better than the 13 A rectangular pin which does considerable damage to paintwork when attached to portable equipment. Personally, I congratulate Mr. Everitt on his wise choice.

Stoneleigh, Surrey.

H. J. WILSON.

Export Co-operation

IN connection with the current export drive, and particularly the interest displayed in the Common Market, we are interested to see a report to the effect that groups of manufacturers have formed themselves into export syndicates. We have noticed that the small boat builders have done this, and we have heard that motor accessory manufacturers are contemplating a similar scheme. These do seem good ideas, and it occurs to us as manufacturers' agents, that sales agents might very well consider forming a similar group.

For ourselves, we are active in the Common Market countries, and we should be glad to co-operate with other agents interested in the European market with a view to exchanging experiences and information. We feel that it is quite likely that we could help each other to avoid certain pitfalls, and at the same time further our own interests and that of the export drive.

London, S.W.10.

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Please send for Technical Sheet 242d.

U.K. Electrical Trade in September

THE marked expansion in electrical exports from the United Kingdom in the early summer was not maintained during August and September. In the three months May-July the value of electrical exports was 20 per cent greater than in the corresponding period a year earlier, but in August-September the difference had fallen to under 3 per cent. Nevertheless, total electrical exports for the first nine months of the year, at £193.7 million, were 14 per cent higher than a year earlier.

Electronic and radio apparatus still shows the strongest advance with a nine months' total of £41 million, 22 per cent more than for the first nine months of 1960. Exports

of cathode-ray tubes have more than doubled this year and there were increases of £1.7 million in shipments of other types of valves, of £3 million in communication and navigation equipment and of over £1 million in components and parts. The leading markets were the Netherlands, Canada and the United States.

There has also been a steady improvement in electrical machinery exports with a September total of £2.5 million compared with £2 million a year earlier. The nine months' figure of £27 million was 8 per cent up on a year earlier and in the third quarter exports of generators and motors were 44 per cent more than in the third quarter of 1960.

TABLE I.—ELECTRICAL EXPORTS

Class	Month of Sept. 1961	Nine months ended September 1960		Class	Month of Sept. 1961	Nine months ended September 1960	
	£	£	£		£	£	£
Generating sets:				Telegraph and telephone installations	390,993	5,319,155	4,000,920
Diesel driven not exceeding 10 kW	79,140	1,159,318	965,135	Telephone instruments	116,083	1,435,389	1,652,485
10 kW to 65 kW	93,101	1,256,299	1,213,632	Parts	779,741	5,922,806	7,588,834
65 kW to 200 kW	98,804	1,058,769	885,925	Line app. for long distance communication	385,332	1,979,248	2,603,383
Over 200 kW	170,025	1,487,259	2,749,386		1,672,149	14,656,598	15,845,622
Driven by steam turbines	—	618,209	276,357	Cookers	32,216	379,369	368,269
Driven by spark ignition engines, hydraulic turbines or other prime movers	89,664	254,901	827,382	All other cooking appliances	54,380	484,601	509,718
Generators:				Parts and accessories	70,017	740,566	710,198
Not exceeding 200 kW	75,688	804,951	1,134,127	Space heating appliances	34,045	222,049	231,654
Over 200 kW	35,089	860,473	505,854	Water heating appliances	39,502	252,504	350,752
Parts	675,924	5,466,158	4,768,005	Other heating appliances	35,981	271,336	419,048
Motors, complete, other than railway, tramway and trolley-bus:				Parts and accessories	135,747	755,708	1,061,891
Not exceeding $\frac{1}{2}$ h.p.	184,663	2,037,864	1,860,193	Irons	57,826	627,007	636,824
Exceeding $\frac{1}{2}$ h.p. but under 1 h.p.	64,813	624,858	787,675	Arc welding equipment, a.c.	30,087	412,637	458,972
From 1 to 250 h.p.	360,583	4,106,799	4,521,767	D.c.	38,268	469,888	406,979
Exceeding 250 h.p.	92,842	1,504,054	1,444,164	Resistance welding	29,001	341,054	440,410
Railway, tramway and trolley-bus motors, complete, and parts of all motors	193,595	1,667,132	2,019,997	Electric furnace plant	92,742	855,248	960,886
Starting and controlling gear for electric motors	294,570	2,355,872	3,240,452	Sparking plugs	164,546	1,878,170	1,827,917
	2,508,501	25,262,916	27,200,051	Electrical appliances for aircraft	243,191	2,531,665	2,813,451
Converting machinery	9,400	583,609	723,531	For motor vehicles	369,018	5,308,317	5,524,497
Mercury-arc rectifiers	34,545	391,467	540,848	For cycles	—	37,530	458,509
Transformers for lighting, heating and power (including coils):				Signalling apparatus (incl. traffic signals)	105,107	1,066,969	1,481,501
Not exceeding 7,500 kVA	236,152	4,111,988	3,588,985	Instruments, commercial	195,880	1,757,894	1,778,876
Over 7,500 kVA	184,125	2,366,279	3,448,719	House service meters (electrical) incl. parts	156,196	1,354,578	1,477,458
Switchgear and switchboards (excl. telegraph and telephone):				Electro-medical apparatus (excl. deaf-aids, X-ray apparatus and batteries)	59,371	405,011	346,791
Switchgear up to 200 A and not exceeding 660 V	279,411	3,849,888	4,468,983	X-ray apparatus (excl. tubes and valves)	65,176	472,172	633,747
Other	904,413	9,731,311	10,256,767	Ceiling fans	49,883	757,317	924,053
	1,648,046	21,034,542	23,027,833	Desk fans and parts of desk and ceiling fans	32,359	243,716	345,161
Batteries and/or cells, primary:				Vacuum cleaners	215,200	1,499,701	2,025,534
For all lighting purposes	150,397	984,334	1,229,659	Floor polishers	31,762	570,506	494,759
For radio	316,437	3,580,974	3,406,872	Food mixers	118,630	492,056	802,374
Other	20,700	359,099	388,247	Hair clippers and dry shavers	117,594	842,730	1,062,634
Parts (excl. carbons)	77,957	461,186	614,577	Other portable appliances	65,610	306,338	561,904
Filament lamps exceeding 28 V	90,442	877,958	973,745	Parts, etc.	131,395	1,565,124	1,579,479
Not exceeding 28 V	30,568	247,768	302,636	Portable tools, incl. parts	273,440	2,227,402	2,665,437
Fluorescent tubular lamps	78,921	604,058	782,305				
All other lamps	28,169	278,431	332,161				
Parts (excl. glass bulbs and carbons)	62,250	404,692	651,644				
Radio and television, etc., apparatus:							
Thyratrons, hot cathode mercury vapour and gas-filled rectifiers (excl. mercury-arc rectifiers), photo-electric cells (excl. photo-transistors), stabilising and cold cathode valves, magnetrons, klystrons	66,518	481,400	689,967				
Cathode ray tubes	97,701	467,908	1,074,379				
All other	506,435	3,621,225	5,293,590				
Parts (excl. glass bulbs)	33,971	451,143	558,869				
Broadcasting and television transmitters	35,307	502,115	614,019				
Communication and navigational and radar equipment	1,414,366	12,980,163	16,036,804				
Domestic receiving sets, mains	23,301	608,656	479,134				
Battery (incl. complete vibrator sets)	63,742	725,135	819,664				
Other (incl. mains/battery and radio for cars)	34,767	267,850	297,038				
Radiograms	16,335	259,777	239,894				
Television receiving sets	88,020	616,135	906,124				
Public address equipment	76,025	878,496	835,805				
Other radio and television apparatus, n.e.s.	265,871	1,078,173	2,027,364				
Components and parts, n.e.s.	983,264	10,071,198	11,113,370				
	3,705,623	33,009,374	40,986,021				
				TOTAL	...	17,590,459	172,396,009
						193,669,415	

TABLE 2.—DISTRIBUTION OF EXPORTS (TABLE I)

Country	Month of Sept. 1961	Nine months ended September 1960	1961
Gibraltar	15,102	204,154	283,847
Malta	48,643	406,391	489,299
Cyprus	81,517	555,633	697,142
Sierra Leone	63,684	345,147	555,643
Ghana	338,685	2,282,270	3,011,110
Nigeria	298,152	4,430,348	3,777,792
Republic of South Africa	1,128,765	11,806,514	13,486,458
Rhodesia and Nyasaland	329,449	5,578,861	5,530,844
Tanganyika	40,537	430,766	436,413
Kenya	172,011	1,694,350	1,468,438
Uganda	44,805	315,186	484,748
Mauritius	23,903	696,062	320,511
Aden	62,065	509,803	716,771
Bahrain, Qatar and Trucial States	118,606	1,095,470	1,305,834
Kuwait	131,617	1,754,338	2,164,777
India	1,062,189	11,494,428	10,367,739
Pakistan	285,287	2,919,799	2,890,849
Singapore	143,077	1,952,301	2,006,279
Federation of Malaya	236,802	1,836,318	2,679,770
Ceylon	149,463	1,562,190	1,601,503
British North Borneo	13,811	181,318	202,335
Sarawak	9,306	146,397	94,347
Hong Kong	350,385	3,514,360	4,231,500
Australia	1,276,034	15,840,441	15,251,305
New Zealand	664,168	7,237,384	9,411,702
Fiji	25,245	168,725	250,012
Canada	588,288	9,453,635	9,196,025
Bermuda	44,798	312,886	484,596
Bahamas	36,046	248,832	343,475
Jamaica	102,067	1,467,332	1,504,456
Barbados	14,337	322,223	297,581
Trinidad	84,334	1,291,669	1,232,963
British Guiana	46,648	598,798	455,480
Other Commonwealth countries	113,922	803,363	961,586
Irish Republic	450,266	3,659,466	4,745,847
Soviet Union	48,548	1,156,054	2,067,175
Finland	222,833	1,559,308	1,619,562
Sweden	501,472	4,525,209	4,933,487
Norway	399,349	2,314,268	2,999,731
Denmark	240,712	2,226,876	2,998,902
Poland	98,553	771,039	1,204,881
Western Germany	670,146	4,495,587	6,397,325
Netherlands	909,521	5,364,247	8,083,119
Belgium	240,201	2,569,298	2,752,751
France	327,149	2,847,850	4,534,255
Switzerland	198,668	1,267,908	1,953,444
Portugal	163,400	1,793,524	1,627,155
Spain	211,358	1,619,592	1,894,884
Italy	524,023	3,509,751	4,878,842
Austria	77,250	633,250	856,469
Yugoslavia	68,022	909,682	861,216
Greece	177,329	835,828	1,641,101
Turkey	312,850	944,372	1,965,923
Portuguese East Africa	10,237	409,495	247,191
Egypt	99,402	849,875	1,108,670
Libya	51,061	519,745	574,892
Morocco (including Tangier)	11,045	254,276	185,890
Congo Republic	39,407	382,833	355,061
Sudan	85,840	1,161,385	1,448,374
Syria	79,235	353,800	533,821
Lebanon	38,840	479,994	667,018
Israel	95,071	799,311	1,372,219
Jordan	66,330	600,299	751,874
Saudi Arabia	40,770	478,494	634,998
Iraq	208,823	2,057,875	2,541,576
Iran	159,857	1,923,165	2,517,770
Burma	56,551	464,986	529,181
Thailand	55,938	592,872	546,830
Indonesia	39,403	787,459	1,712,087
China	23,460	1,056,175	585,411
Japan	116,579	600,466	683,801
United States of America	1,216,052	9,704,314	8,238,891
Cuba	89,172	253,537	261,793
Mexico	72,931	728,232	860,743
Colombia	36,588	377,370	424,424
Venezuela	43,604	2,664,406	820,871
Peru	65,672	236,875	455,188
Chile	42,103	698,587	1,025,962
Brazil	89,575	413,898	755,923
Uruguay	15,996	214,754	152,765
Argentine Republic	262,252	3,521,877	3,334,329
Other foreign countries	393,267	3,168,853	4,133,123
TOTAL	17,590,459	172,396,009	193,669,415

TABLE 3.—SOURCES OF ELECTRICAL IMPORTS

Country	Month of Sept. 1961	Nine months ended September 1960	1961
Australia	78,517	298,323	529,505
Canada	182,406	1,036,100	1,764,724
Other Commonwealth countries	307,959	1,988,038	2,458,275
Irish Republic	174,604	1,002,233	1,153,780
Sweden	210,036	1,021,569	2,042,651
Denmark	97,492	610,170	911,750
Western Germany	924,719	6,787,766	7,999,668
Netherlands	623,075	5,209,587	5,411,592
Belgium	32,879	375,066	454,175
France	153,690	1,638,695	2,506,117
Switzerland	180,026	1,479,772	1,937,310
Italy	88,794	219,312	1,008,632
United States of America	1,498,969	14,173,824	14,730,248
Other foreign countries	517,652	1,945,629	3,698,562
TOTAL	5,070,818	38,786,084	46,606,989

after having been 15 per cent down in the second quarter. Important increases were recorded in large generating sets, traction motors and starting and control gear and the leading customers were the main Commonwealth countries, the United States and Argentina.

Though the level of exports of transformers and switchgear was not maintained in the third quarter (it was 2 per cent less than a year earlier after having been 17 per cent more in the second quarter), the nine months' total was, at £23 million, still £2 million more than for the corresponding period of 1960. The territorial distribution was similar to that of electrical machinery. The Commonwealth was also the outstanding market for telephone and telegraph equipment and the third quarter total showed an increase of 20 per cent over the third quarter of 1960 compared with an increase of 13 per cent in the second quarter. Wires and cables were down by 4 per cent after having shown an increase of 12 per cent in the second quarter.

Electrical imports for the first nine months of the year, at £46.6 million, were £7.8 million more than a year earlier, and imports of motors (£2.2 million) were almost double the 1960 level.

TABLE 4.—OTHER ELECTRICAL AND ALLIED EXPORTS

Class	Month of Sept. 1961	Nine months ended September 1960	1961
Domestic electric washing machines incorporating centrifugal water extraction	325,776	2,439,456	3,368,494
Other, with or without wringers	229,387	1,967,765	2,029,746
Dryers (exported as separate units)	27,250	320,599	265,263
Parts	126,636	1,059,642	1,424,006
Electric locomotives (incl. battery types)	6,645	2,780,766	1,574,434
Diesel locomotives with electric transmission	—	1,952,822	176,144
Welding electrodes:			
Ferrous	93,015	1,079,347	951,419
Non-ferrous	33,978	236,098	275,882
Electric conduit tubes and cased tubes	67,562	792,563	819,717
Electric carbons	244,747	1,152,711	1,654,908
Electric lighting fittings and lanterns (excl. arc lamps, searchlights and cycle lamps)	283,831	3,046,239	3,103,739
Electric fork-lift trucks	141,988	910,319	1,459,102
Water and gas turbine, etc.	618,921	3,733,693	7,134,764
Steam turbines	947,567	10,032,631	6,309,251

TABLE 5.—ELECTRICAL IMPORTS

Class	Month of Sept. 1961	Nine months ended September 1960	1961
Generators, incl. parts	141,095	775,180	1,000,986
Motors, incl. parts	200,473	1,632,410	2,188,571
Convertors; transformers; rectifiers	159,259	1,545,147	1,427,748
Switchgear and switchboards (other than telegraph and telephone)	160,336	1,268,729	1,794,656
Bulbs, arc lamps and tubes for electric lighting, complete	126,464	789,856	1,003,081
Cathode ray tubes, complete	64,235	428,619	333,169
Transistors (incl. photo-transistors), complete	73,532	983,195	833,961
Other, complete	186,043	2,168,058	2,223,782
Parts (excl. glass bulbs)	71,548	887,495	731,870
Radio receiving sets, domestic or portable	112,297	422,928	897,513
Radio communication and navigational aids, complete	426,623	3,937,582	4,693,177
Other radio and TV apparatus, parts and accessories	445,041	3,607,971	4,044,479
Telegraphy and telephony apparatus	67,265	500,335	690,867
Welding machinery	64,061	550,252	871,730
Electrical cooking and heating apparatus	198,004	1,508,264	1,944,520
Magnets, ignition, and electric appliances for aircraft, motor vehicles and cycles	322,535	2,748,783	2,893,204
Instruments, commercial	90,492	746,327	1,014,899
Electro-medical apparatus (incl. X-ray apparatus)	139,627	868,746	1,166,924
Portable mechanical appliances, electrically operated, complete	204,700	1,128,468	1,513,183
Parts	65,999	514,610	519,073
Industrial electronic control equipment	96,659	507,331	995,038
Scientific electrical instruments (excl. telegraphic and telephonic)	220,251	1,935,644	2,135,581
Other machinery, apparatus and appliances	1,434,279	9,330,154	11,688,977
TOTAL	5,070,818	38,786,084	46,606,989

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Councils of the University of Manchester and the Manchester College of Science and Technology have approved the appointment of **Mr. Colin Adamson**, M.Sc.(Eng.), D.Sc., A.M.I.E.E., to a newly created (second) Chair in Electrical Engineering in the Faculty of Technology. Dr. Adamson was awarded the degree of B.Sc.(Eng.) at London University in 1947, following studies at the Hull and Bradford Technical Colleges, and qualified for the degree of M.Sc.(Eng.) London in 1952 as a result of research work while engaged as assistant lecturer at the Bradford College and as research engineer with A. Reyrolle & Co., Ltd. He



Dr. C. Adamson

was appointed lecturer in electrical engineering at Manchester in 1952 and senior lecturer in 1959 and was awarded the degree of D.Sc. last July.

Dr. Adamson has been responsible over the last few years for the development in the College of an extensive power systems laboratory for both undergraduate and post-graduate work, the latter forming a large sub-section of the post-graduate school in electrical engineering. His various projects have received substantial industrial support, much of it under contract, and have resulted in the filing of several patents. Both personally and in conjunction with colleagues he has published a large number of original papers and a textbook. He is a college representative on E.R.A. and has served in an expert capacity on committees of C.I.G.R.E. Recently he has served as visiting professor at the University of Roorkee, India, under the Colombo Plan, and he has lectured at the Universities of Washington and Wisconsin, U.S.A.

Mr. G. M. Wolfe, chairman and managing director of Wolf Electric Tools, Ltd., left by air for Australia on 21st October on a four weeks' business trip. Apart from visiting the company's principal distributors, the main part of Mr. Wolfe's time in Australia will be spent at the Wolf factory, Strathfield West, nr. Sydney, where he will deal with important future development plans. He is leaving Australia on 16th November for India,

via Singapore and Colombo, and on 1st December Mrs. G. M. Wolfe will officially inaugurate a large extension to the Ralliwolf factory at Mulund, nr. Bombay.

Mr. G. R. Kent, A.M.I.E.E., M.I.R.S.E., and **Mr. M. H. Wheat**, A.M.I.E.E., M.I.R.S.E., have been appointed principal executive assistants in the Department of the Chief Signal Engineer of London Transport. Mr. Kent will have the title of maintenance engineer (signalling) and Mr. Wheat that of design engineer (signalling).

Consequent upon Mr. A. J. Leather's new appointment (see *Electrical Review*, 20th October, page 627), **Mr. W. H. Mills**, A.M.I.E.E., at present manager of the Rhondda District of the South Wales Electricity Board, is to become manager of the Merthyr and Aberdare District and **Mr. A. C. Davies**, M.C., A.M.I.E.E., at present manager of the Pontypridd and Caerphilly District, will become manager of the Rhondda District.

Mr. A. A. Evans has been appointed sales manager of the Capacitors and Resistors Division of the Plessey Co., Ltd., Swindon. Previously he was Swindon regional sales administrator.

Mr. W. A. Haythornthwaite, principal assistant (final accounts) of the

Essex Sub-Area of the Eastern Electricity Board, has been appointed accountant of the Suffolk Sub-Area. He succeeds **Mr. G. W. Ruck**, who has moved to Essex.

Mr. A. J. Wakeling, B.Sc.(Eng.), A.M.I.E.E., has recently been appointed chief designer of the Power Transformer Department of the British Electric Transformer Co., Ltd., an associate company of Crompton Parkinson, Ltd. Mr. Wakeling started at Hayes in 1941

as an engineering apprentice and on the completion of his studies joined the staff of the Transformer Engineering Department. He made extensive tours of South Africa in 1955 and Australia in 1957 as a technical representative in support of sales efforts in those territories.

A. C. Morrison (Engineers), Ltd., have appointed **Mr. D. B. Waugh**, F.C.A., as financial director and **Mr. D. L. Coller**, B.Sc., A.M.I.E.E., as sales director.

Mr. R. E. Fischbacher, B.Sc., A.R.C.S.T., A.M.I.E.E., has been



The Minister of Power, Mr. Richard Wood, presented Queen's Commendation for Brave Conduct awards and British Empire Medals to representatives of the electricity supply industry at a ceremony at Lancaster House, London, on 11th October. The photograph shows the chairman of the Electricity Council, Sir Robertson King, K.B.E., with the recipients who were entertained at Winsley Street, London, after the presentation. Front row (left to right): Mr. J. A. Ball (B.E.M.), East Midlands E.B.; Sir Robertson King; and Mr. F. C. Rawlings (B.E.M.), South Wales Division, C.E.G.B. Back row: Mr. T. P. Leonard (Queen's Commendation for Brave Conduct), South Wales E.B.; Mr. C. W. Sykes (B.E.M.), Eastern E.B.; Mr. T. Beeley (B.E.M.), Yorkshire E.B.; Mr. H. Lambert (B.E.M.), London E.B.; and Mr. A. E. Milsom (Queen's Commendation for Brave Conduct), South Western E.B.

appointed an assistant director of the British Scientific Instrument Research Association. He served for 12 years in the Admiralty Signal and Radar Establishment before joining the B.S.I.R.A. in 1957 to become head of the Electronics Department.

Mr. R. N. Millar, M.A.(Cantab.), B.Com., M.I.Mech.E., M.I.E.E., who,

as reported on page 666, has been appointed chairman and managing director of G.E.C. (Engineering), Ltd., was educated at Marlborough College, Cambridge University and the University of South Africa. After service as an engineer officer in the Royal Navy during the war he was appointed assistant mechanical engineer with the British General Electric Co., Pty., Ltd., Johannesburg, subsequently becoming chief mechanical engineer of the B.G.E.C. in Sydney, Australia. Towards the end of 1954 Mr. Millar was recalled to England to take charge of nuclear energy developments in the G.E.C., and later that year became manager of the G.E.C.-Simon-Carves Atomic Energy Group. Early in 1957 he was appointed assistant general manager of the Erith Works of the G.E.C., becoming general manager a year later. In 1959 he became a director of the company and was appointed managing director of the Engineering Group in 1960.

The North Western Branch of the Electrical Trades Commercial Travellers' Association held their annual luncheon on 12th October at the Lancashire County Cricket Club Pavilion, Old Trafford. The guest speaker, Mr. W. G. D. Gregg (national chairman, Association of Supervising Electrical Engineers) proposed the toast to the E.T.C.T.A. and spoke of the work being done for charity. He

At the annual luncheon of the North Western Branch of the Electrical Trades Commercial Travellers' Association. Left to right: Messrs. L. A. Fickling, W. G. D. Gregg, D. N. Hyde, C. G. Walker and H. Chadwick



Mr. R. N. Millar

also stressed the importance of training facilities for future technicians. Mr. D. N. Hyde (national chairman, E.T.C.T.A.) responded. Mr. L. A. Fickling (past national chairman) made the charity appeal. The toast to the guests was given by Mr. H. Chadwick (branch chairman), Mr. W. T. Parker responding. A collection for the E.I.B.A. realised the sum of £34, which was made up to £40 by a member present.

The Minister of Power has re-appointed **Lord Citrine**, G.B.E., LL.D., Companion I.E.E., as a part-time member of the Electricity Council.

Mr. D. G. Brown, O.B.E., J.P., M.I.Mech.E., has been re-appointed chairman of the North Eastern Electricity Consultative Council.

Mr. J. C. Gladman, B.Sc., has been appointed manager of the Computer Engineering Department, A.E.I. Electronic Apparatus Division, Trafford Park. Mr. Gladman, who was educated at Varndean School, Brighton, and Manchester University, joined the Metropolitan-Vickers Electrical Co., Ltd., in 1948. He became assistant chief engineer of the Computer Department in May, 1959, and two months later, on the formation of the A.E.I. Electronic Apparatus Division, was appointed assistant manager, Computer Engineering Department.

Mr. Arthur Webb, F.C.I.S., secretary of the Birmingham Area of the Midlands Electricity Board, is retiring at the end of the month after more than 40 years in the electricity supply industry. Mr. Webb served with the Stoke-on-Trent, Watford and Birmingham undertakings, taking up his present position when the Midlands Board was formed.



Mr. E. W. Semmens, managing director of Nalder Bros. & Thompson, Ltd., with Mrs. Semmens receiving guests at the 62nd annual dinner and dance of the company

The 62nd annual dinner and dance of **Nalder Bros. & Thompson, Ltd.**, took place on 14th October at the Empire Rooms, Tottenham Court Road, London. The gathering of 300 guests represented personnel and friends from the London and Poole Works and included a number of past employees. Mr. E. W. Semmens, A.M.I.E.E., managing director, presided at the dinner.

Mr. E. E. Webster has been appointed general manager of the Plessey Co., Ltd., Swindon Region.

Mr. Webster joined Plessey in 1950 as chief inspector and subsequently became divisional manager, Capacitors and Resistors Division. In 1959 he was appointed management executive responsible to Mr. A. E. Underwood for production operations of the company and its subsidiaries in the Swindon region.

Atlas Lighting, Ltd., have appointed **Mr. John L. Murphy**, J.P., A.R.I.N.A., A.I.Mar.E., as sales supervisor of their Marine Lighting Department.

Mr. N. R. Livesley has been appointed assistant superintendent, X-ray Department, at the Motherwell Works of Associated Electrical Industries, Ltd.

On Friday last over 400 members and guests attended the 45th annual dinner of the **Birmingham Electric Club**. After the Lord Mayor of Birmingham, Ald. E. E. Mole, had proposed a toast to the Club, Mr. A. R. Leith, president, said that it was founded by 17 men in 1904 and now

there were over 800 members. The toast to the guests was proposed by Mr. R. A. Joseph, junior vice-president, and Mr. R. M. Fairfield, assistant managing director British Insulated Callender's Cables, Ltd., responded.

Mr. J. E. Swainson and Mr. A. S. Moseley have been appointed directors of Permalit, Ltd.

Mr. W. I. Neilson, formerly chief accountant and secretary, has been elected a director of Lumenated Ceilings, Ltd.

At the annual general meeting of the Diesel Engineers' and Users' Association on 19th October **Mr. F. D. M. Gamble**, A.C.G.I., M.I.Mech.E., M. I. Mar.E., was installed as president.

Mr. Edward H. Twaits has recently been appointed general manager of the Electronics Division of Amphenol-Borg, Ltd., Whitstable, Kent. The company is a subsidiary of Amphenol-Borg Electronics Corporation of the U.S.A. Mr. Twaits was formerly executive director of the Plessey Components Division.



Mr. E. H. Twaits

The Leon Gaster Memorial Premium of the Illuminating Engineering Society for 1961 has been awarded jointly to **Messrs. H. R. Ruff, H. E. Bellchambers and G. K. Lambert** (A.E.I. Lamp & Lighting Co., Ltd.) for their paper, "Modern Aids to

Lighting Design—Computer Techniques," which was presented at a meeting of the Society in London last January.

Mr. S. Davis has been appointed a director of the Backer Electric Co.,



Mr. S. Davis

Ltd., Rotherham. Since joining the company in 1938 he has been closely connected with the development of the Backer tubular sheathed element process under C. B. Backer, the founder, ultimately becoming production manager in 1942 and works manager in 1953. In recent years he has played a major part in extending the production facilities to include an alternative manufacturing process employing the latest American techniques.

OBITUARY

Mr. F. A. King.—One of the last remaining links with Lord Kelvin has been broken by the death of Mr. F. A. King, at Greywell, Hants, on 18th October. Mr. King retired from Kelvin & Hughes, Ltd., in 1955 after 55 years' service. He was born in London in 1880 and in 1900 became an assistant in the private laboratory of Dr. J. T. Bottomley, a nephew of Lord Kelvin. During this period he was closely associated with Lord Kelvin and the many instruments which he designed. In 1935 Mr. King became managing director of Kelvin, Bottomley & Baird, Ltd., and was principally responsible for the erection of the Basingstoke

factory, one of the first to be built in Britain solely for the manufacture of aircraft instruments. He was awarded the C.B.E. for his part in the supply of instruments and equipment to all three services in the last war. With the amalgamation of Kelvin, Bottomley & Baird and Henry Hughes, Ltd., Mr. King became joint managing director with Mr. G. B. G. Potter of the new company, Kelvin & Hughes, Ltd., a position he held until he became consultant director to the company.

Mr. A. G. Lang, of the Electrical Measurement Division of Elliott Brothers (London), Ltd., who completed 50 years' service with the company and its associates in March, was seriously injured in a road accident on 5th October and died from his injuries on 16th October.



The late
Mr. A. G. Lang

Mr. Lang was educated at Finsbury Technical College and joined Siemens Brothers at Woolwich in 1912, becoming manager of the Measuring Instrument Department. In 1941 he transferred to Elliott Brothers, Lewisham, as sales manager of the Electrical Measurement Division. His many activities included service on several technical committees in connection with the B.E.A.M.A. and he was chairman of the Instrument Transformer Committee.

Mr. W. Nutter.—The death occurred suddenly on 14th October of Mr. Walter Nutter, area sales manager of the Leeds depot of Chloride Batteries, Ltd. He was 59.

WILLS

Mr. W. F. Higgs, founder and late chairman of Higgs Motors, Ltd., who died on 8th August, left £23,758 gross (£10,003 net).

Mr. G. R. Thursfield, M.I.Mech.E., F.Inst.F., former chairman and managing director of the Sturtevant Engineering Co., Ltd., who died on 26th August, left £523,706 gross (£500,589 net). He left £500 to the Benevolent Fund of the Institution of Mechanical Engineers.

Mr. W. C. C. Turner, formerly of Crompton Parkinson & Co., Ltd., who died on 23rd July, left £14,746 gross (£14,307 net).

Mr. T. H. Martin-Harvey, A.M.I.E.E., formerly chairman of the Metropolitan Electric Cable & Construction Co., Ltd., who died on 9th July, left £54,760 gross (£53,432 net).

Major V. C. M. Gonie, R.E. (M.C.S.) retd., formerly of the C.E.G.B. South Western Division, who died on 20th July, left £62,794 gross (£62,518 net value).

Major H. G. Rowe, O.B.E., formerly manager of turbine sales, B.T.H. Co., Ltd., who died on 29th June, left £40,889 gross (£40,618 net value).

Drake & Gorham's 75 Years

In 1886 Bernard M. Drake started up business as an electrical engineer, with £500 which he had borrowed, and soon afterwards was joined by John Marshall Gorham. Thus began a firm whose name has been prominent in the annals of the electrical industry ever since. The firm's main activity was the installation of small generating sets in country mansions and other large buildings (notably Chatsworth House) and this remained the staple business for many years. In pre-first-war days installations were put into Kensington Palace, Windsor Castle, Eton College and many other important places. Gradually the company branched out in other directions as manufacturers of electrical equipment and as agents. An illustrated account of the company's career and expansion

is contained in a 20-page booklet issued in connection with the celebration of the 75th anniversary. Mr. Bernard Drake died in 1931 at the age of 73 and his son, Mr. R. H. M. Drake, then became chairman and managing director, later being joined by Mr. W. Parker as co-managing director.

To commemorate its anniversary, the company is holding a number of staff celebration dinners. At the first, which was held at the Connaught Rooms, London, W.C.2, on 17th October, about 130 of the staff, including several retired members, were welcomed by Mr. R. H. M. Drake. During the course of the evening the guests were able to inspect some of the interesting features of the early days of the company which were on view in the form of a small exhibition.

INDUSTRIAL NEWS

G.E.C. Engineering Company Formed

A NEW company, G.E.C. (Engineering), Ltd., has been formed to take over and develop the engineering activities of the General Electric Co., Ltd. This is in accordance with the new policy of the G.E.C. to form its manufacturing groups into subsidiary companies.

The manufacturing resources of the new company comprise the Electrical Engineering Works at Witton, Birmingham, and the Mechanical Engineering Works at Erith, Kent. The total number of employees exceeds 15,000.

The board will operate from headquarters in London and negotiations for the acquisition of suitable premises are at present in progress.

The following appointments have been made:—Chairman and managing director, Mr. R. N. Millar; director and general manager (Witton Works), Mr. T. H. Kelsey; director and general

manager (Erith Works), Dr. K. J. Wootton; commercial director, Mr. C. J. O. Garrard, financial director, Mr. E. Nicholson; development director, Dr. H. K. Cameron; production director, Mr. G. M. F. Donnelly; personnel director (and assistant general manager, Witton Works), Mr. W. D. Morton; and secretary, Mr. J. E. Thomas.

The two members of the board new to the G.E.C. organisation are Mr. Donnelly and Mr. Nicholson. Mr. Donnelly will join the new company

on 1st January, 1962, when he will relinquish his appointment as general manager of British Northrop, Ltd. Mr. Nicholson, whose appointment to the Engineering Group was announced recently, was formerly a deputy director, U.K.A.E.A. Production Group.

Two further appointments of importance to the new company are Mr. D. W. T. Angwin, previously chief resident engineer, Hunterston nuclear power station, who now becomes assistant general manager, Erith Works; and Mr. J. C. Morris, previously commercial manager, United Power Co., Ltd., Erith, who now becomes commercial manager, export projects. Both these appointments are effective from 1st January, 1962.

ELECTRICITY FOR THE HOTELIER

AT the Trade Fair to be held in conjunction with the British Hotels and Restaurants Association Conference at the Town Hall, Torquay (30th October to 2nd November), the Electrical Development Association will emphasise that electric catering improves hygiene and makes for clean and pleasant working conditions. Also, being independent of flues, the electric kitchen can be designed to suit the flow of work from preparation to serving. Apart from a chef's range, rotary toaster and specialised appliances such as an infra-red grill, some

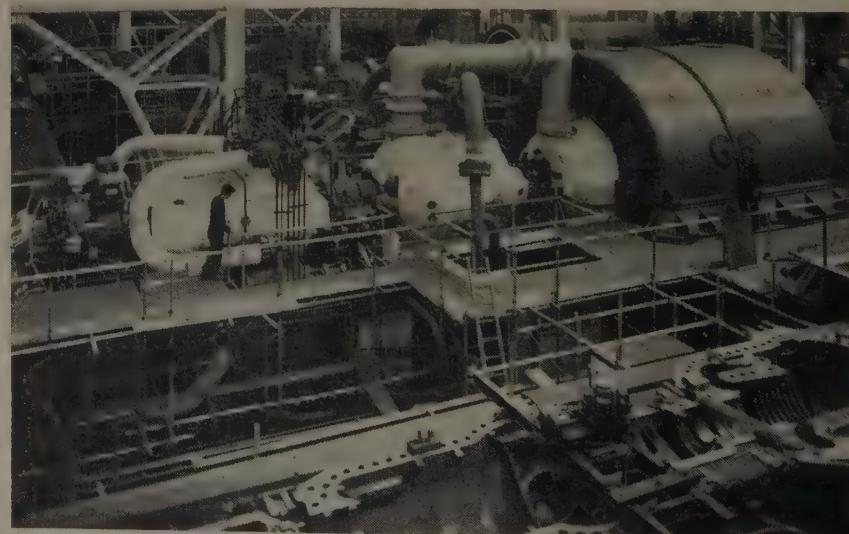
interesting miscellaneous equipment will be on view, including an electrically-operated silver burnishing machine. A free-standing waste disposal unit will also be shown, as well as an electric pot and pan scrubber.

Part of the E.D.A. stand will be devoted to showing how electricity creates comfort conditions in lounges and other public rooms. A number of electric heaters will be shown and there will be a display dealing with electric floor warming. Air-conditioners will include a recently introduced portable unit.

Generating Plant for Richborough

The first of three 120 MW turbo-alternator sets being built by Richardsons Westgarth (Hartlepool), Ltd., for the new C.E.G.B. power station at Richborough recently completed its

shop tests and is now being dismantled for dispatch to site. Each set consists of a three-cylinder reheat turbine and a hydrogen cooled alternator, generating at 13.8 kV.



No. 1 set for Richborough power station after shop steaming trials, with No. 2 machine being erected on the test bed

P.O. ENGINEERS' PAY AWARD

Pay increases ranging from 6½ to 7½ per cent, back-dated to 1st January, 1961, have been awarded to members of the Post Office Engineering Union by the Civil Service Arbitration Tribunal. In view of the pay pause, however, the award is to be limited to the 5½ per cent offered by the Post Office before the two-day hearing last month. When the additional amounts are eventually paid, the difference will not be made retrospective.

Electricity Supply Workers' Wages

THE claim for a £2 a week increase in the wages of manual workers in the electricity supply industry was rejected at a meeting on 18th October. It was based on the increase in the cost of living, comparable earnings in other industries and the increased productivity and prosperity of the industry.

In their reply the Boards' representatives pointed out that between June, 1947, and August last the labourer's basic weekly wage had risen by 101 per cent and the working week had been reduced by five hours. Moreover the industry's surplus had fallen from about £27 million in

1959-60 to £16 million in 1960-61. Although no "directive" had been received from the Government, the Boards had to have regard to the country's economic position.

It was hoped that economic difficulties would soon be surmounted. In the meantime the Boards were prepared to discuss the improvement of the status of the experienced workers by treating them as "established" after a reasonable number of years, with some improvement in service conditions, and placing them on a weekly wage instead of an hourly rate. Overtime would continue to be paid. Such a scheme could not be put into operation immediately but would need to be introduced by stages. Wages of workers who would not qualify for such a scheme could be discussed when present economic difficulties had been overcome.

A meeting was to be held yesterday (Thursday) for the continuation of the discussion.

Crompton Parkinson Lamp Publicity Campaign

During last season Crompton Parkinson, Ltd., broke away from traditional themes for lamp publicity with a scheme that presented the inside story of lamp design and manufacture and in view of its success the same basic theme is being adopted this year. Point-of-sale material includes an attractively presented cut-out showcard in multi-colour; a mobile which whilst being of a design that draws attention does not take up valuable space; a cleverly contrived display centrepiece that can be employed equally well in windows, on counters, shelves, etc.; and a compact floor standing dispenser unit to house lamps in three readily accessible compartments. As well as providing this extensive sales aid support for Crompton "Life-light" lamps, the company is again providing attractive showcards and leaflets in respect of their "Newshape" lamps. For their newly introduced "Golden Crompton" lamps there are special showcards and sales aid literature.

EFCO VACUUM FURNACE DIVISION

From 1st November the vacuum furnace activities of Efcos Furnaces, Ltd., will be handled by a new division with offices, design and manufacturing facilities at Sheerwater, near Woking, in Surrey. Mr. M. J. Severs, B.Sc., A.M.I.Mech.E., formerly with the furnace department of the General Electric Co., Ltd., has been appointed technical manager of the new division and Mr. W. Kuyser, B.Sc., previously vacuum sales manager of the General Engineering Co. (Radcliffe), Ltd., has been appointed sales manager.

Domestic Ventilating Fans

By an oversight no mention was made of Woods of Colchester, Ltd., in the section of our Domestic Issue (13th October) dealing with electric fans. This company's "Xpelair" fans for domestic and similar purposes are made in a number of sizes from 6in to 12in in diameter. They are fitted with iris shutters and built-in switches, operated by cords. Several colours are available and the fans are easily removed for cleaning.



"Xpelair" 6in diameter domestic ventilating fan

Permali Factory for India

Arrangements have been made for the setting up of a £127,000 Permali factory at Bhopal in India to manufacture a full range of densified wood laminates. The operating company will be Permali-Wallace, Ltd. This new company is the outcome of collaboration between Permali, Ltd., and Chas. Lowe & Co., Ltd., with the Indian Plywood Manufacturing Co., Ltd., and the Wallace Flour Mills Co., Ltd., of Bombay.

Construction of the factory buildings is scheduled to begin in November and the whole installation should be completed by the late summer of 1962. The initial annual turnover is estimated at £250,000. Full manufacturing facilities are being incorporated, including a press shop, machine shop and finishing departments. A special feature of the factory is the provision of humidity control equipment in the processing areas to overcome the extremes of the Indian climate. The special purpose process plant and most of the machine tools are being sent from Britain.

Indian sources will be used almost

entirely for the raw materials, the special resins required being manufactured on the premises by Permali-Wallace, Ltd., and combined with suitable indigenous timbers.

The directors of the new company are: British—Messrs. A. A. Heath and R. W. Lowe. Indian—Messrs. J. V. Kanji (chairman), N. V. Kanji, K. S. Lauly and C. K. Vissanji. The new factory will be staffed entirely by Indians and some of the key personnel will first receive special training in this country. Mr. R. Ely, of Permali, Ltd., Gloucester, has been appointed resident engineer and liaison officer in India.

New English Electric Company in France

A new company, La Compagnie Continentale d'Equipements Electriques (C.E.E.), has been formed by the English Electric Co., Ltd., and the French firm, Les Exploitations Electriques et Industrielles, to carry out the manufacture and sales of all types of electrical and electronic control equipment for France and the Common Market countries.

Change of Address

R. W. Gregory & Partners, consulting engineers, have moved to 42, Kingsway, London, W.C.2 (telephone: Holborn 9671).

Domestic Supplement—
Electric Cookers—at the
end of this issue

Cambridge Instrument Co. Extensions

SPEAKING at the luncheon following the opening of the new wing at the Chesterton Road Works of the Cambridge Instrument Co. (see page 657), Dr. P. Dunsheath, C.B.E., chairman, said that many eminent scientists had been associated with the company since Sir Horace Darwin had made instruments on the site 80 years ago. The Cambridge Microscan was likely to have an impact comparable with that of the electron microscope. Eight had been sent or were going to the United States (representing half a million dollars) and four to Europe. Research had led to a great increase in production. Exports took a leading place in the company's business. In 1959 their value was £360,000; in 1960 £525,000; and this year they hoped to exceed £600,000. Dr. Dunsheath announced that with the Italian company Istrumenti di Masura C.G.S. they had formed a company—Cambridge-C.G.S.—with a capital of 300 million lire (£172,000) to produce instruments in a factory at Casoria, near Naples.

Sir Keith Joseph praised the company for its export activities. He said that the Government was constantly

being pressed to provide incentives for exporters in the way of tax concessions, etc., but it would not do this in the face of trade treaties: it would lead to a form of competition in which this country would be worse off. Nobody could ignore exports because they thought their home market was safe. Tariffs must inevitably be reduced with a consequent increase in pressure upon the home market.

Mr. H. C. Pritchard, managing director of the company, spoke of the harmonious relations within the organisation and commended the architect and contractors for the new extension.

"CLIMASOL" HEAT PUMPS

A demonstration of the recently introduced "Climasol" range of heat pumps for heating, cooling and ventilating is to be held at the Old Electricity Showrooms, St. James Street, Burnley, from 1st to 7th November (10 a.m. to 5 p.m. daily). Admission tickets may be obtained from Lucas Industrial Equipment, Ltd., Hargher Clough, Burnley (telephone: Burnley 5051).

Eggborough Power Station

The Central Electricity Generating Board has received consent from the Ministry of Power for the construction of the 2,000 MW Eggborough power station on the River Aire, about four miles to the east of Knottingley, Yorks. When completed in 1968, the station will contain four 500 MW turbo-generator/boiler units. The first set is due for commissioning in 1966.

Fall in Boards' Appliance Sales

August is normally a poor month for retail trade and sales of electrical appliances are no exception. The latest return issued by the Electricity Council shows that demand for the major types of appliance was well down on the previous month, the sharpest fall being in sales of refrigerators (from 30,938 to 10,318).

Type of Appliance	Month ended 31st Aug., 1961		Twelve months ended 31st Aug., 1961	
	Total	Change %	Total	Change %
Cookers ...	26,944	+ 2.0	352,231	+ 3.9
Water Heaters	16,941	+ 1.8	194,670	+ 2.2
Immersion Storage	4,440	- 14.2	62,787	- 7.1
Wash. Boilers	4,207	- 7.3	54,079	- 9.7
Washing Machines ...	7,943	+ 2.1	104,482	- 21.9
Refrigerators	10,318	+ 12.7	141,018	- 3.9
Clothes Dryers	1,676	- 40.8	52,741	n.a.

ARROW'S NEW SOUTHALL FACTORY

MORE than 250 customers, suppliers and other friends of Arrow Electric Switches, Ltd., were received by Mr. T. S. Crabtree, managing director, at the company's new offices and works at Brent Road, Southall, last Wednesday. The occasion was the official opening of the premises and the ceremony was performed by Mr. George B. Seawright, executive vice-president of the parent company, the Arrow-Hart & Hegeman Electric Co.

It is less than 30 years since Arrow

Electric Switches commenced activities and since 1932 never more than a few years has elapsed before expansion became necessary. In 1933 the company occupied a 10,000 sq ft works at Hanger Lane, Ealing, and four years later a 20,000 sq ft extension was added. Further extensions were required after the war and in 1948 the only remaining piece of land on the site was used for a 5,000 sq ft temporary building. By 1955 Arrow found it necessary to lease a factory at

Uxbridge, in which their rapidly expanding magnetic control gear assembly department and moulding shop were housed. Eventually, the working conditions at both Ealing and Uxbridge became so congested that negotiations were opened to acquire the present plant at Southall.

The number of employees at the new factory is over 600 and all processes of manufacture from raw materials to the finished product are now possible under one roof.



The new Southall factory of Arrow Electric Switches, Ltd., and (right) a view of the manually operated switch assembly bay



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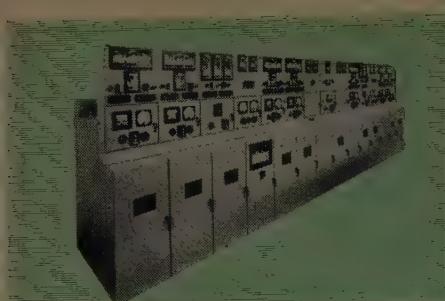
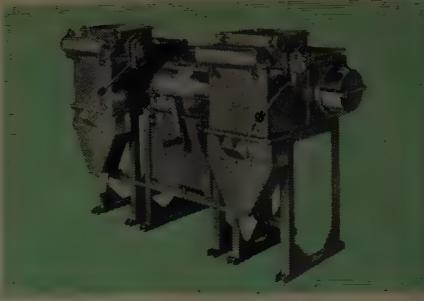
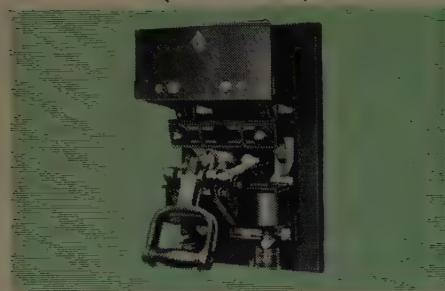
ELECTRICAL ENGINEERS AND CABLE MAKERS
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Bradford Bristol Cardiff
Edinburgh Exeter Glasgow
Ipswich Manchester Newcastle
Nottingham Portsmouth Sheffield



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insulated with rubber,
p.v.c., polythene, butyl or
silicone rubber.*

*Mains Cables
insulated with paper,
varnished cambric or p.v.c.
Cables for Special Purposes*

11 K.V. Metalclad Switchboard
(Air Insulated)Heavy Current D.C. Circuit Breaker
and Knife Switch PanelH.V. Ring Main Switchboard with
Fuse Switch controlling Tee-Off

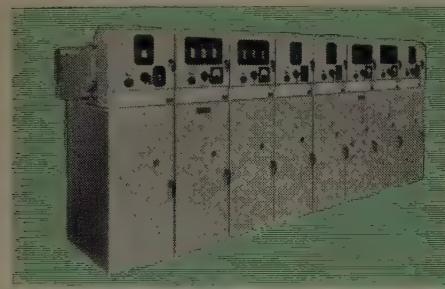
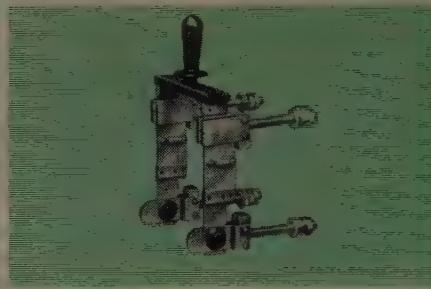
Small Air Circuit Breaker



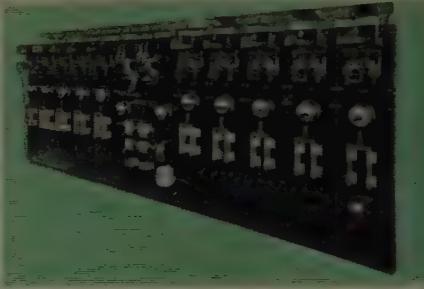
Ammeter and Voltmeter Switches



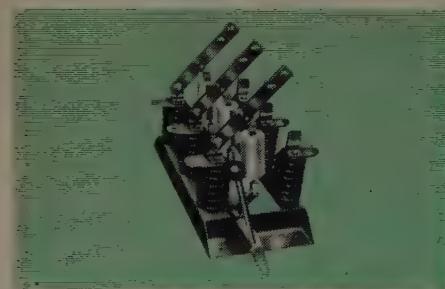
L.V. Industrial Oil Circuit Breaker

11 K.V. Metalclad Switchboard
(Compound Filled)

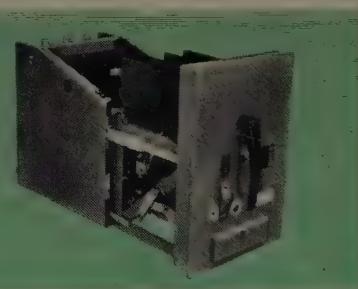
Panel Mounting Knife Switch



D.C. Switchboard for Steel Works



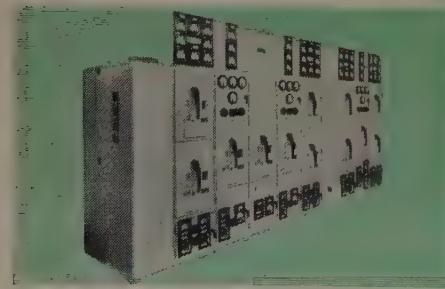
T.P. 11 kV Isolating Switch



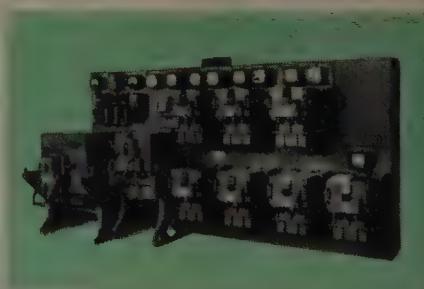
L.V. Draw-out Air Circuit Breaker



L.V. Metalclad Air Circuit Breaker

L.V. Switchboard with Draw-out Air
Circuit Breakers

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Welding Plant Manufacture

EXTENSIONS costing in the region of £350,000 have recently been completed at the works of Murex Welding Processes, Ltd., at Waltham Cross, Hertfordshire. The new buildings consist of a 500ft long single-storey production shop having an uninterrupted floor area of 62,000 sq ft for the manufacture of electric arc welding plant and a two-storey office block of 7,200 sq ft to accommodate the plant sales department, drawing office and works engineer's department.

The all-welded steel frame and roof construction of the new plant shop follow the same design as that of the original factory building erected in 1938 which created widespread interest by demonstrating the large uninterrupted floor areas which could be obtained by means of welded construction. The new factory extension is not joined to the main building but is sited so that a connecting bay between the two can be added later.

The new office block has been designed to incorporate the latest ideas

in modern office accommodation and is equipped with an air heating system, electric under-floor heating in the foyer and glare-free artificial lighting of high intensity. The external walls generally consist of a curtain walling of aluminium

alloy frames with double sash windows and metal infill panels. The end elevations are of brick construction and allow for future extensions. Murex



The new factory building and office block of Murex Welding Processes, Ltd.

"Vodex" and "Fastex 5" metal arc welding electrodes and Murex welding equipments were used for all the welded construction of both buildings.

E.C.A. ACTIVITIES

THE Electrical Contractors' Association is urging its members to take an active interest in the office lighting campaign which is being conducted by the British Lighting Council, in which the E.C.A. is represented. To back up the Council's efforts the Association has produced a pamphlet asking "Are You Ready for January 1st, 1962?" (the date on which the new legislation on office conditions comes into force). This, with a card requesting a light-meter test and report, is intended for circulation to the contractors' actual and potential customers.

Members of the E.C.A. have been asked to make early application for tickets for the annual dinner (Grosvenor House, London, 13th February, 1962). The price is £2 2s each. Forms of registration have also been sent out for the annual conference (Eastbourne, 17th-21st May, 1962). They include provision for the booking of hotel accommodation.

Attention has been drawn by the E.C.A. to the safety regulations for

the construction industry which come into force on 1st March next and will affect electrical contractors engaged on building sites or where structural alterations to existing buildings are involved.

Opportunities for Graduates

The 1962 edition of "The Directory of Opportunities for Graduates" has recently been published by the Cornmarket Press, Ltd., 86-88, Edgware Road, London, W.2. The reference section details the openings for employment and the opportunities and prospects offered to university graduates by over 415 industrial and commercial organisations and Government Departments. The classified index summarises in tabular form information about the size of the organisations, whether men or women are employed and the areas in which employment is offered. Articles in the editorial section deal with such subjects as the way in which industry is growing, the expected effect of the Common Market on employment and the relative merits of employment in London and the provinces. Some 21,500 copies are being distributed free of charge to all final-year students at universities in the United Kingdom. Other copies are available from the publishers, price 8s 6d.

Further Snowy Mountains Contracts

American firms have been awarded three contracts, valued at about £16,700,000 sterling, for the next stage of the Snowy Mountains hydro-electric development. The work covers the construction of tunnels and a dam. Tenders were submitted by a number of Australian and British concerns. Mr. Menzies, the Australian Prime Minister, in announcing the award of the contracts, said that further tenders would be called for soon and that the last four contracts would probably involve about £25 million.

TRAVELLING SCHOLARSHIPS

The Court of the Worshipful Company of Tin Plate Workers has again decided to offer up to 12 travelling scholarships, each to the value of £50, on the same terms and conditions as last year.

INDUSTRIAL NEWS *[continued]*

New Offices for Rotunda

ON 11th October Sir William McFadzean, chairman of British Insulated Callender's Cables, Ltd., opened a new office building for Rotunda, Ltd., on the Manchester to Sheffield road at Denton, Lancs. The company, which has factories at Denton and Clayton, is a member of the B.I.C.C. group. Originally formed in 1928 to make identification tapes for electric cables and adhesive insulating tape, its range of products has since been considerably enlarged and now includes adhesive tapes for protection, masking and packaging, electrical repair and jointing tapes, insulating and sheathing materials and wrapping and protective materials for electric cables.

The original offices, which were built

in 1936, were incapable of enlargement and the new block now houses the whole of the office staff of the company. To allow for further expansion, the building has been designed to carry a third floor. The total floor area is 10,000 sq ft and the whole is warmed by the "Panelec" floor-heating system. To prevent heat loss each floor is insulated and all the external windows are double-glazed. For interior wiring the ring main system is used. Over two miles of B.I.C.C. mineral insulated copper sheathed cable is employed with p.v.c. cable for conduit wiring.

The total load is 140 kW. H. Bailey & Co., of Denton, were the electrical contractors.

XENON LAMP FOR DUNGENESS LIGHTHOUSE

The first Trinity House lighthouse designed for operation from a central control point will soon be in service. This lighthouse is situated at Dungeness and incorporates a "Mazda" 2 kW 300,000 candle power high pressure xenon arc discharge lamp. This lamp is about 12in long and weighs less than 21 lb. It is equipped with a simple drum lens in contrast to the large rotating lenses (weighing up to five tons) which have been used in the

past with either a continuously burning paraffin vapour burner or tungsten filament lamp as the light source.



"Mazda" 2 kW xenon lamp for Dungeness Lighthouse

Because of the small size and low weight of the lamp the lighthouse is designed as a slim tower with a height of 115ft and a diameter of only 12ft.

Visit to Rheostatic Works

Recently about 60 delegates to the Institute of Heating and Ventilating Engineers' International Conference, including heating contractors, consultants and many overseas members visited the Rheostatic Co., Ltd. In two parties they toured the branch works at Frimley, Surrey, the Main Works at Slough, and the Ajax and Buckingham Works.

Replacement for "Elettra II"

The Marconi International Marine Communication Co., Ltd., has placed an order with the Fairmile Construction Co., Ltd., for a new research and demonstration vessel which, when completed, will replace the present *Elettra II*.

Harnessing the Orange River

The South African Minister of Water Affairs told the Free State Congress of the National Party recently that he would ask the Government in November to approve the first phase of a plan for the overall development of the Orange River. When complete the proposed scheme would be "far larger" than Kariba, he said. He added that the development of the Orange River would be undertaken simultaneously with the Pongola scheme in Natal.

POWER REACTORS

Sir William Cook, Member for Reactors, United Kingdom Atomic Energy Authority, introduced the first showing of the Authority's new film "Nuclear Power Reactors" last week. The film surveys the world's nuclear power reactor systems, those already proven and in operation, and others still under development. Largely by the use of animated sequences it illustrates how cores, coolants and moderators (the main components of reactors) are combined to form different systems. One of the systems illustrated is the gas-cooled graphite-moderated natural uranium reactor used in the Calder Hall nuclear power station. October 17th was the fifth anniversary of the official opening of Calder Hall by Her Majesty the Queen.

The 35-minute sound film is in colour and is available in 16 mm or 35 mm sizes. It can be obtained free on loan from the Public Relations Branch, U.K.A.E.A., 11, Charles II Street, London, S.W.1.

Aid for Indian College

Mr. R. N. Dogra, principal of the Delhi College of Engineering and Technology, met Mr. P. F. D. Tennant, C.M.G., O.B.E., overseas director of the Federation of British Industries, and other representatives of British industry at the F.B.I. headquarters on 10th October. British industry has provided over £250,000 towards the equipment of the College while the British Government is providing fifteen professors over periods of five years and a number of additional services. The Government of India is providing the buildings and all other staff, services, and locally available equipment. The first group of 150 students is equally divided between the departments of civil, mechanical, electrical and chemical engineering, and textile technology.

GLASGOW MODERN HOMES EXHIBITION

IN co-operation with 26 leading manufacturers the South of Scotland Electricity Board showed an impressive display of the latest electrical equipment in the electricity pavilion at the Modern Homes Exhibition at the Kelvin Hall, Glasgow, from 4th to 21st October. The highlight of the presentations was a quiz contest

entitled "Sparks and Spuds," with 32 sessions every day. Competitors were asked to identify electrical appliances viewed from unusual angles and flashed on a screen. Half-hour demonstrations of cooking, refrigeration, foods, home laundry and dish-washing were given, nine each day interspersed with displays of fashions.



Part of the electrical display at the Modern Homes Exhibition in Glasgow

G.E.C. CONTROLS FRENCH LAMP COMPANY

The General Electric Co., Ltd., has acquired a controlling interest in Adès Frères, the French lamp manufacturing company, which will in future be known as Lampe G.E.C. de France S.A. By this association Osram will supply full technical information and assistance and will direct production at the Paris factory.

Chloride Batteries Luncheon

In accordance with their usual custom, Chloride Batteries, Ltd., held a lunch for the motoring and technical Press on the opening day of the Motor Show in London last week. After lunch Mr. A. W. Browne, chairman of the company, said that they had a good business in exporting batteries but owing to tariffs it was impossible to sell batteries in certain countries. To combat this the Chloride Group now had companies manufacturing "Exide" or "Chloride" batteries in eleven different countries outside the United Kingdom and further arrangements such as this were under consideration. In some countries it was impracticable either to sell direct or manufacture locally and the only course was to operate through "know-how" agreements with licences.

Trade Announcements

Elliott Brothers (London), Ltd., announces that it is now able to supply the whole range of Datex analogue-digital convertors and associated units, some of which are already in production under an exclusive licence from Giannini, Ltd., the British affiliate of the Datex Corporation, Monrovia, U.S.A. These devices are used extensively in data-handling applications in ground and air navigational systems and throughout the industrial process-control field.

As a preliminary step towards the full integration of the two companies in January, 1962, the Spares Departments of **Mirrlees, Bickerton & Day, Ltd.**, and the **National Gas & Oil Engine Co., Ltd.**, are being combined into one unit at Ashton-under-Lyne from 6th November. Correspondence relating to spares should continue to be addressed to the company concerned, but from 6th November all telephone inquiries for spares should be made to Ashton-under-Lyne 1861.

Lamberts, Ltd., have removed their London warehouse from 97/99, Southwark Bridge Road, S.E.1, to 276/284, St. James' Road, Camberwell, S.E.1 (telephone: Bermondsey 5746), where they now hold large stocks of iron and

Plant for Tanganyika

Two 10,500 kW generators driven by vertical Francis turbines have been ordered from the English Electric Co., Ltd., by the Tanganyika Electric Supply Co., Ltd. The value of the complete contract, including associated gear, is some £300,000. The equipment will be installed in an underground power station on the River Pangani. It is known as the Hale Scheme and it should go into operation early in 1964.

The power generated will be fed into the existing Tanga system and transmitted at 132 kV to Dar-es-Salaam. The English Electric Co. has already received an order for 33 kV substation switchgear, valued at some £30,000, which will be used in the transmission network.

The cost of the whole scheme is approximately £5 million, of which the Tanganyika Government is advancing to the supply company £1 $\frac{1}{4}$ million and the Colonial Development Corporation £3 million. Balfour, Beatty & Co., Ltd., are responsible for the design and construction of the civil works and the transmission system.

steel tubes and fittings for gas, water, steam and electrical services. The head office remains at 55, Southwark Street, S.E.1 (telephone: Hop 1045).

The address of **Strachan & Henshaw, Ltd.**, to which all correspondence should be sent, is now Ashton Works, Ashton Vale Road, Bristol, 3 (telephone: Bristol 664677).

The Montgomerie Reid Engineering Co., Ltd., announces that it has taken over **R. H. Corbett & Co., Ltd.**, of Rochester, Kent, and will now manufacture and market the company's complete range of trucks including the "Hydriver," the "Hycaddy," the "Hydrum" and the "Hybin."

Magnetic Devices, Ltd., have been appointed sole concessionaires for the manufacture and sale of the remanent relay developed by the Telephone Manufacturing Co.

Catalogues Required

Morley's Electrical Services (Holloway), Ltd., 117 Hornsey Road, London, N.7, state that they are revising the catalogue library in their Estimating Department and would like manufacturers to send them copies of their latest catalogues.

EARLS COURT MOTOR SHOW

Progress with Automobile Electrical Systems

THE development of components for car electrical systems is following the pattern set in a number of other industries. In addition to providing new electrically-operated services on vehicles, a considerable effort is being made to reduce the size and weight of the conventional components, and their current consumption in view of the comparatively limited supply available. Examples of both trends can be seen at the 46th International Motor Show organised by the Society of Motor Manufacturers & Traders, Ltd., and currently being held at Earls Court, London.

One of the most promising recent developments, the a.c. generator feeding the system through semiconductor rectifiers, is not yet incorporated in British production cars, although it has been used for some time in certain commercial and service vehicles which have a large radio or similar load. It is likely, however, that there will be a British production private car so equipped at next year's show.

There are many innovations and unconventional items to be found, typical being the duplicated ignition system for the V12 engine in the Ferrari, one for each bank of six cylinders, and the use of three ignition coils in parallel for the three-cylinder two-stroke engine in the Auto-Union. Instead of a reserve petrol tap, the new Rover 3 Litre has two S.U. electric pumps, only one of which draws from the whole tank, switched as required by the driver.

A wide variety of fusing arrangements is to be seen. The Saab has a fuse for each headlamp filament, four being required for the two lamps, while the Triumph "Herald," which was completely unprotected when it was introduced, now includes one fuse to cover all circuits except the horn and starter motor. The Saab also boasts an electric fuel pump which has a double diaphragm and double points. Five fuses on the new Jaguars are reached by releasing two screws and lowering the hinged central instrument panel. In these cars the engine tachometer is supplied from a generator driven off the inlet camshaft, unlike the present trend shown by the Bristol 407, Aston Martin DB4 and Lagonda "Rapide," which are fitted with

electronic tachometers detecting the ignition current pulses.

Many of the electrical developments can be seen on the four Joseph Lucas stands and, of course, on the cars in which some have already been incorporated. An electromagnetically-operated, three-bobbin control box has been introduced for use with the present range of shunt-wound d.c. generators having either $4\frac{1}{2}$ or $6\ \Omega$ field windings. The new unit operates on the current-voltage system of generator output regulation and comprises two separate vibrating armature type, single-contact regulators and a cut-out relay. One regulator is responsive to changes in current and the other to voltage. The voltage regulator and cut-out relay are temperature compensated to allow for operating changes in the circuit resistance and for climatic variations in battery voltage. The effect of temperature fluctuation on control box settings is further minimised by the use of a swamp resistor connected in series with the shunt coils of the voltage regulator and cut-out relay. Toothing adjustment cams are carried on the front limb of each magnet frame to enable voltage and current settings to be made with a special tool available to garages.

Fuel Pumps

A considerable reduction in fuel line vapour locks can be achieved if the pump is mounted below the surface level in the fuel tank, a principle used with the new model 2FP pump, fitted to the latest "E" type and Mark X Jaguars. The pump comprises a single body, housing a permanent magnet field electric motor, and an impeller. An earthing washer on one of the fixing bolts provides an electrical path from the pump to its mounting bracket, to prevent the build-up of electrostatic charges on the unit. The insulated-return motor is supplied through two p.v.c.-covered cables passing through armour-braided tubing within the fuel tank, with petrol-proof unions at both pump and tank outlet. The armature runs at approximately 2,900 r.p.m., according to the voltage and load. In operation, the whole of the interior of the unit, including the commutator and brushgear of the motor, is



Left: Mixed four-headlamp system, using two 7in and two $5\frac{1}{2}$ in units, on the new Lagonda "Rapide."



Right: Lucas three-bobbin current-voltage regulator, showing the toothed adjustment cams



Top left: Concentric type starter motor shown by Simms Motor Units, Ltd.

Bottom left: Crypton high speed battery tester

Above: Headlamp beam aimer by Lucas for sealed beam lamps

flooded with fuel. When the pump is running, fuel passes through the armature bearing at the pump end of the unit, into the motor chamber and thence through a return passage to the pump intake port. This continuous circulation obviates fuel stagnation in the motor portion. A fuel flow of some 20 gal/hr is available at a delivery pressure of 2 p.s.i. when the engine is running, i.e. when the battery voltage is about 13.5 V. Power consumption under these conditions is some 20 W.

Four-headlamp systems, using all the lamps on main beam and switching to the second filament in two units for the dipped beam, at present in use on some British vehicles, are based on four 5½in diameter light units. Although these are an improvement over the more conventional two-lamp systems, an even better performance can be obtained by the use of 7in diameter lamps for the units which produce the meeting beam. The 7in lamps have an efficiency in light flux collection claimed to be 22 per cent above that of the smaller unit for equivalent filament wattage, and offers better control of the meeting beam. Such arrangements can be seen on the new Lagonda "Rapide" and Jaguar Mark X. Another lighting development likely to find widespread future use concerns direction indicator lamps having about double the present intensities for daytime use, automatically reduced at night when the tail and side lamps are switched on to intensities approximately half of those now in use. This system will not be applied to the front direction indicators as these have to be seen against headlamp glare at night.

Windscreen Wipers

Two-speed windscreens wipers have been fitted to some models for several years, but an innovation this year is the variable-speed wiper fitted to the Ford "Consul Classic," the speed being selected by the driver using a switch control. Another new wiper on view is the model 6W, the most powerful in the Lucas range, intended for high-performance cars or those with large curved windscreens. This incorporates a two-speed shunt-wound 12 V motor consuming 3.4 A at the normal blade frequency, reducing to 2.6 A at the higher speed. If the wiper blades are prevented from moving by packed snow or

ice, the motor supply is broken by a current/temperature sensitive switch built into the motor and utilising the magnetic field between the armature and yoke to give a snap action to the contacts. Other new components include the model 9H "Windtone" horn which is of reduced weight and consumes only 3½ A, eliminating the need for a relay in the horn circuit. These horns are fitted to the new Austin Healey "Sprite." Thermostatically-controlled fans are becoming popular on some high-performance cars, as fan cooling is necessary only at low speeds or when idling, yet the power consumed by the fan at high speed may be several horsepower. The model 3GM electric fan is switched by a relay when the coolant temperature is between certain limits, and consumes less than 7 A at 12 V.

A 12 V motor has been developed for mounting inside car doors to power window mechanisms. It is compact, 3½in by 1½in by 4½in excluding output shaft, and has a split series field winding for reversible operation. When raising a window the current consumption is approximately 12 A. The unit can withstand shock accelerations up to 70g to which door-mounted equipment is subjected. To prevent dust and water ingress, the motor is totally enclosed in a rubber shroud. It is controlled by a three-position single-pole change-over switch, duplicated for rear windows to enable either driver or passenger operation. The circuit is under the over-riding control of the ignition switch and includes a relay to handle the operating current and obviate overloading the ignition switch contacts. A thermostatic circuit-breaker is also included to protect the motor and circuit.

In an ignition system for very-high-performance engines, an electromagnetic pick-up is associated with pole pieces attached to the engine flywheel. As the engine rotates, a voltage impulse is produced at the pick-up each time one of the pole pieces passes within its field. This pulse is applied to a trigger amplifier, effectively a normally-closed switch allowing current to flow through the primary winding of a trigger transformer. The voltage pulse results in this current flow ceasing. The energy released by the current collapse induces a voltage in the transformer secondary winding, and this causes a current to flow in the base circuit of a spark generator unit. An associated

transistor thereby becomes conducting, so that current flows in the primary winding of a high-voltage transformer. A regenerative oscillation is initiated, resulting in a very rapid increase in primary current, which gives rise to an induced voltage in the transformer secondary of over 20 kV. This is fed to a rotor arm and is distributed to the spark plugs in the normal way. Regeneration ceases when the transformer is saturated, and the transistor again becomes non-conducting. The complete cycle time for regeneration is less than 200 μ sec. With the cessation of the voltage pulse at the pick-up, conduction again commences in the trigger amplifier circuit in readiness for the cycle to be repeated at the next pick-up pulse. A spark rate of 1,000/sec is possible, equivalent to an eight-cylinder engine at 15,000 r.p.m. It is unlikely that this system will be used for ordinary production vehicle engines, but it is now in use in the latest Coventry Climax and B.R.M. V8 racing engines.

Among the other items on view are small, lightweight horns employing a secondary diaphragm and of low current consumption, eliminating the need for a relay when a matched pair are fitted, shown by the AC-Delco Division of General Motors, Ltd. These "Actone" horns have been introduced on the new Vauxhall "Victor" models. Also on this stand is a new brake light switch

which is mounted on the brake pedal pendant inside the vehicle.

A 4½ in diameter concentric type starter motor, in which the pinion is engaged with the flywheel teeth before the main motor torque is applied, is shown for the first time by Simms Motor Units, Ltd. The "Major" fog and spot lamps introduced by the Wipac Group are sealed units incorporating an aluminised reflector. New 6 and 12 V car batteries shown by A.E.I., Ltd., are of standard and heavy duty types, with plates charged and sealed at the factory for immediate use after the addition of acid.

Testing Equipment

As usual, a considerable section is devoted to equipment for garages. Typical new items on view include a Lucas headlamp beam aimer for sealed lamps, in which units are attached to each lamp and the alignment between them checked optically; the Crypton "Speedtester" which enables battery capacity and condition to be checked in less than four minutes; and the Triangle Products, Ltd., butt welding attachment for resistance spot welders up to 15 kVA.

The exhibition closes on Saturday, being open today and tomorrow from 10 a.m. to 9 p.m.

Research at Imperial College

THE research report of the City and Guilds College of the Imperial College of Science and Technology, London, for the period 1958-61, was published recently. The City and Guilds College consists of the five engineering departments of Imperial College and the report is divided accordingly. The research in the Department of Electrical Engineering included work with a model power system. This equipment is being used to study several problems arising in the operation of steam turbo-generators or hydro-electric generators in large power systems. The voltage regulator simulator used with the model has been constructed so that, with suitable adjustments, it can represent a wide range of possible methods of control and a corresponding analytical method has been worked out to enable many alternative regulating systems to be studied.

An investigation now in progress seeks to establish a method of calculating the damping effect of eddy currents in the rotor iron of a turbo-generator. In conjunction with the model installation, further items of equipment are being developed to simulate the components of the power system external to the electrical machines. These include impedance elements to represent an a.c. transmission network, rectifiers and invertors to represent a d.c. transmission system and simulating equipment to represent the characteristics of prime movers and governing systems.

The theoretical and experimental work of the control section during the last three years has been directed towards providing a basis for the solution of complex problems associated with automatic control. Great progress has been made in an effective analysis of situations where a number of controls are required to be co-ordinated to produce an optimum result, the plant behaviour being variable, complicated and disturbed. The research work

in the materials laboratory has continued in three main directions: the study of the characteristics of semiconductor materials and their subsequent use in devices; a general study of the action of surface impurities on the properties of semiconductors and metals; and the investigation by electrical methods, using alternating shearing stresses, of the visco-elastic behaviour of liquids, with particular reference to lubricating oils. A gas discharge device of a new type is being investigated by the electron physics section. In this device, heat is converted directly into electrical energy. The work is being carried out in conjunction with the National Research Development Corporation.

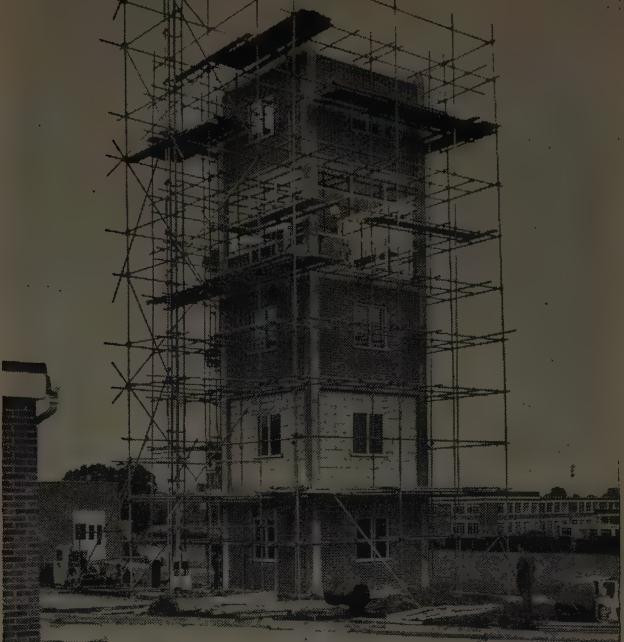
In collaboration with the General Electric Co., the nuclear power group has designed a small research reactor which it is hoped to install at Silwood Park to provide irradiation facilities for London University as a whole and for other possible users in the area. This "Consort" reactor is water moderated and cooled and is of the open tank type. The basic design is for 10 kW power but an increase in output to 100 kW involves only minor changes in design.

Recently-published designs by the nuclear power group at Imperial College have indicated that the commercial potential of small magnox power stations has been seriously underestimated. The features of these designs have been the comparatively small size of the reactor core, the use of a low primary coolant pressure and the incorporation of a pre-stressed concrete reactor vessel. Other work includes the development of a successful technique for the determination of the effectiveness of control rods for nuclear reactors, while the study of the overall optimisation of a nuclear power station is also being carried out.

The new E.R.A. building which will be used for off-peak heating investigations

OFF-PEAK HEATING CONTROL

New Experimental Building at Electrical
Research Association's Laboratories



WHEN we visited the Electrical Research Association Laboratories at Leatherhead last week we saw something of the work which is being done there in connection with the central control of off-peak heating of large blocks of flats and offices. This work is being conducted by the Heat Section, which is headed by Miss M. W. Griffith, and is part of a comprehensive programme which has been going on for nearly 20 years.

To be suitable for off-peak floor heating, floors have to be of solid concrete, so that the heat can be stored in them to warm the building during the hours when the electricity is not directly available. The building itself will also affect the success of an off-peak storage heating system, since, if the walls are heavy, some heat will collect in them. With modern buildings, however, when large areas of glass are used, the process may be quite different. Many successful floor-heating installations have been made, but it is necessary to find out the reasons why they are successful, and on what factors this success depends, so that the knowledge can be applied to new types of buildings and different conditions of comfort which may be required.

Economic Heating

In the national interest the electricity available for off-peak heating must be made to stretch as far as possible. Any improvement in the methods of control of an off-peak electric heating system, so that only the necessary amount is used for the required purpose, will not only help to conserve the general supply, but will also enable consumers to heat their premises more economically.

The simplest type of control is the thermostat which switches off the supply when the required temperature has been reached, and this is sufficient for most private houses. In schools and commercial buildings, more elaborate methods can be used, since the possible savings allow more money to be spent on a suitable device. Most of these controls work automatically, postponing the switching on of the electricity until the latter part of the night on a warm night. In very cold weather it will, of course, be necessary to heat the floor for all the off-peak

hours available, say, from 7 p.m. to 7 a.m. On a warmer night it may not be necessary to switch on until midnight and the room will still be at the right temperature at 7 a.m. when the supply is switched off.

It would be better still if one knew, the night before, how the weather was going to change the next day, so that allowance could be made for this. The simplest thing that can happen is for the temperature to fall or rise, so that more or less overnight heating than given by the existing night temperature would be desirable. Other weather factors, such as sunshine, rain, cloud cover, humidity, will all act either to increase or decrease the amount of heat needed during the day after the heat has been stored in the floor overnight. However, it is not at present known how much allowance to make for a change in any of these weather conditions. A formula is needed so that the hours of overnight heating can be calculated if the weather forecast is known. For example, wind will increase heat loss, so that if high winds are expected, longer pre-heating is needed. If the next day is to be sunny, then the pre-heating will be shorter, and so on.

Because the behaviour of an off-peak floor-heating system will depend on the kinds of walls in a building as well as on the weather, several experimental buildings have been erected by the E.R.A. at Leatherhead. Three of these have been in use for two years. They consist of an instrument cubicle and two single-storey huts which can be arranged to behave either as corners of a large heavy-walled office building or of a large light-walled factory building. They are used for simple comparisons of the amount of electricity needed, say, for direct electric heating in the daytime and off-peak floor heating, both giving the same daylight temperature. Weather changes are observed, but the result of an experiment is the total quantity of electricity required over a whole heating season, and the present controls are simple thermostats.

The E.R.A. has now improved upon this. A five-storey building is being erected which will be used to find the effect of weather conditions, past, present and future, on the amount of electricity needed to pre-heat a floor for daytime comfort. Attempts have been made before, but

it has only been possible to study buildings of one type at a time. The buildings have been occupied and there has been little control over temperature and ventilation. The results have not been conclusive because of these difficulties. It has, therefore, been decided, with the special financial support of the Electricity Council, to begin by doing very simple and careful tests in this new building. It has five storeys, because the effect of sunshine on a glass-walled building and a brick-walled building will be different. Highly-insulated walls will give another variation. Roofs and solid ground floors are complications. Thus, the new experimental building has a cavity brick top floor and ground floor and also a central cavity brick-walled room. Sandwiched between these are a room with glass curtain walls and a room with special light-weight concrete walls (this has a very good thermal insulation value). Each room has windows and since most heated enclosures have at least one inside wall, the north wall in each case, which is built of cavity brick and

contains all the pipework and services, is to be covered with a thick layer of insulation so that no heat will be lost through it. Access to the rooms is via a spiral staircase on the north wall outside the building.

The first part of the experiment will be devoted to separating the various effects of the natural weather changes as they occur. These will show up as variations in the amount of electricity required to keep a constant temperature night and day in the various rooms. Differences in the time lags will appear. A rainstorm, for example, may have two effects—bricks may become wet and conduct more heat away, or a water film on the surface will alter the way heat is lost through the wall surface.

After these effects have been disentangled, which will probably take two winters, off-peak or non-continuous heating will be used; occupancy will be simulated, lighting used and, in general, all the disturbance which can be thought of will be put in to see what difference it makes.

SUPPLY PLANNING

THE electric power supply service had to satisfy all the requirements and demands created by modern society without being in a position to control the magnitude of such demands. From this opening remark, Mr. W. Szwander, in his chairman's address on 10th October to the Northern Ireland Centre of the Institution of Electrical Engineers, went on to describe the necessity for and the extent of planning requirements in the electricity supply industry.

Planning was specifically affected, and hence made even more important than in other industrial fields, by the following factors:—(a) The exceptionally high and sustained rate of expansion of the service; (b) the tremendous technological progress in the field of equipment used; (c) the very large capital investments involved, and the very high share of the capital charges in the total cost of the final product; (d) the very long periods of time required to plan, construct and bring into operation the new technical facilities; (e) the necessity of maintaining a continuity of development when new installations were made; and (f) the fact of the public ownership of the supply services.

Only early enough planning and start of construction of new generating stations could assure their readiness in time when their availability became indispensable to meet the demands. Apart from the required adequate availability, the choice of the prime sources of energy for generation of electric power was very strongly influenced by the general national policy. Having been compelled by reason of availability or national policy considerations to adopt a certain type of generation, the planner had to arrive at achieving the best possible results in a given framework through correct blending of the types and sizes of new units with those of the plant already in service.

An additional difficulty was introduced by the ever-real scarcity of suitable sites for building new generating stations, every type of station presenting its peculiar requirements. This problem could often acquire such

proportions as to become almost the decisive factor in the decisions to be made. The planner also had to follow closely and continuously the progress in the field of research work which in time might lead to the adoption of entirely novel methods of electric power generation. It had to be realised that only ten years ago wide circles of power supply engineers were unaware of the potentialities of nuclear energy for power production.

Mr. Szwander went on to describe planning required for transmission, distribution, consumers' services, administration, and management.

Technical College Teachers

THE target figure of 18,600 full-time technical college teachers by 1961 set by a special committee in 1957 has been reached and passed, says a report ("Teachers for Further Education"; H.M. Stationery Office, 1s 3d) of the National Advisory Council on the Training and Supply of Teachers, published last week. The report now estimates that the number of technical college teachers will need to be doubled by the end of this decade. Steps to meet this demand are being examined.

Calculating on the basis of observed trends in recent years in the number of students alone, the Council estimates that the present total of technical teachers would need to be increased to about 27,000 by 1963-64 and to about 37,000 by 1970. These figures, the report points out, make no allowance for new developments in technical education. To achieve the 1970 total, the average recruitment rate, allowing for wastage through retirements and other reasons, will need to be stepped-up to some 3,600 annually. The recruitment total for 1959-60 was about 3,000.

A section of the report discusses the supply of teachers in the "shortage" categories, such as graduates in mathematics and science and various technologies, or those holding advanced qualifications in technological subjects.

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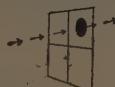
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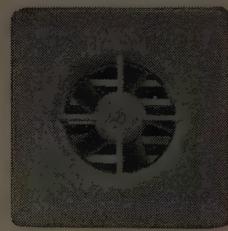
CONTROL SWITCH
TYPE SD



WALL MODELS

with ivory fascia

6"



7½"



9"

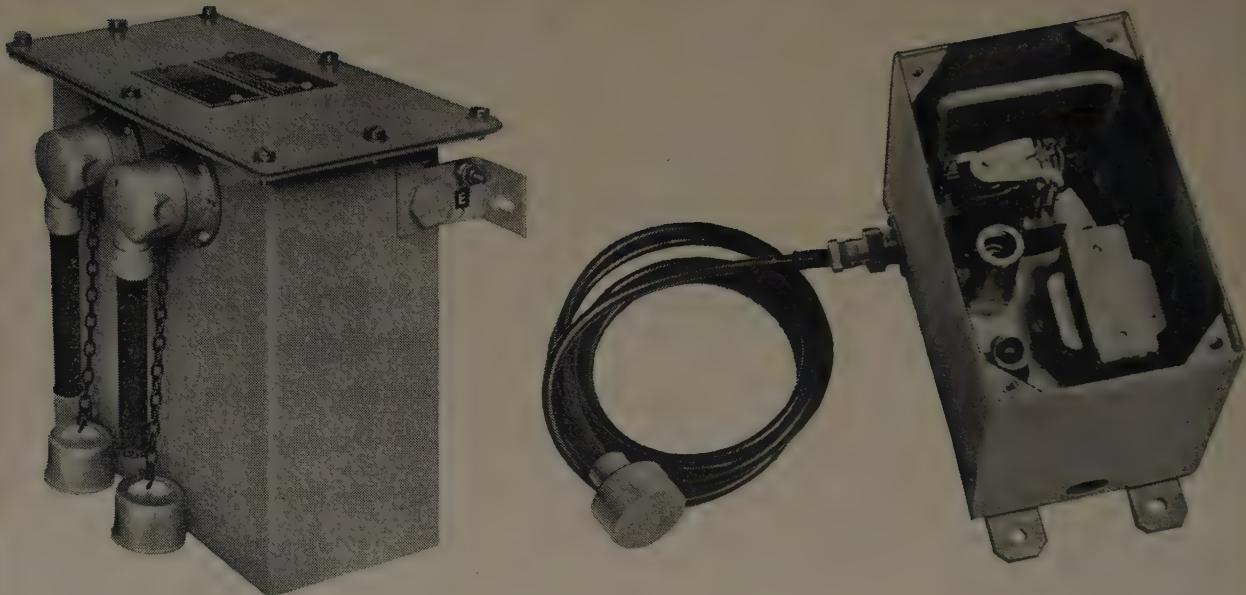


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Global Communication

By R. J. HALSEY, C.M.G., F.C.G.I., D.I.C., B.Sc.(Eng.), M.I.E.E.

TELECOMMUNICATION across the oceans began with the completion of the first transatlantic telegraph cable in 1866 and by the end of the 19th century there existed a world-wide telegraph network. This, however, had a message capacity of only a few "bits" per second and did not allow of subscriber access. In 1928, plans for a single-channel transatlantic telephone cable were formulated but came to nothing because of the economic depression and the advent of short-wave radio. With all its shortcomings, this, with telegraph cables, provided world service until 1956 when the first transatlantic telephone cable (TAT-1) was completed.

The main crossing to Newfoundland is an American system employing two cables, each with 51 unidirectional amplifiers and providing 36 high-grade telephone circuits or their equivalent. The terminal voltage necessary to energise the repeaters is about 2 kV at each end or 4 kV total. The mechanical problem of placing amplifiers on the ocean bed at a depth of nearly three miles was solved by making the housings flexible and of small diameter so that they could be passed round the drum of conventional cable-laying gear as an integral part of the cable.

Deep-Sea Cables

The reliability of cable, housings and electronic equipment is such that there is only a small probability of failure in 20 years; such a requirement applies to all the systems discussed and greatly exceeds that of anything else yet encountered in the electronic art and communication satellites are the only other field in which similar requirements can be foreseen. British submarine cable practice at the time of TAT-1 was to use only a single cable with rigid, both-way amplifiers; this had not then been adapted to great distances or ocean depths but was used to provide 60 circuits over 330 miles of the continental shelf between Newfoundland and the mainland of Canada.

Conventional deep sea cable derives its strength and protection from an external helical wrapping of high-tensile steel wires. It thus has the nature of a long helical spring which may accumulate some thousands of turns under the tension arising from its own weight. This gives rise to a major problem in laying rigid repeater units and, as early as 1952, the Post Office had started work on a revolutionary design of deep sea cable (usually termed "lightweight") in which the strength member is at the centre and is torsionally balanced; the external finish is polythene. In such a cable external holding forces must be transferred to the tension member by shear forces in the component parts; frictional resistance between the components is therefore of major importance.

In 1957 it was agreed between Cable & Wireless, Ltd., and the Canadian Overseas Telecommunication Corporation to provide a large-capacity system to Canada using British repeaters and lightweight cable. This system, now nearly complete, includes 90 repeaters, energised by 5 kV at each terminal station and provides 80 telephone circuits or their equivalent. Necessary preliminaries

Summary of the author's inaugural address as chairman of the Electronics and Communications Section of the Institution of Electrical Engineers which was delivered at a meeting in London on 25th October

involved proving the lightweight cable, increasing the strength of the housings to withstand 5 tons/in² hydraulic pressure, redesigning the repeaters to operate at 5 kV and providing laying gear which could handle the repeaters without stopping the ship. These problems were all successfully overcome and the CANTAT system is by far the most advanced system existing today.

In 1958, the Commonwealth evolved a plan for an all-British "round-the-world" cable similar to and including CANTAT; this would cost some £88 million for a distance of nearly 30,000 miles. The transpacific section (COMPAC) linking Canada with New Zealand and Australia was put in hand in 1959; time was taken by the forelock in that the greater system was agreed before the lesser (CANTAT) had been completed and proved. A further section, linking Australia with Singapore and Hong Kong, has been agreed technically but has not received the approval of governments.

Meanwhile the American Telephone & Telegraph Co. started a new design which accepted and incorporated all the basic principles of the British system, including lightweight cable. After extensive development they have now evolved a system providing 128 circuits over a single cable 3,500 miles long; this will be used to provide a direct system from the United States to this country in 1963 and, subsequently, a transpacific system at Japan and the Philippines.

A number of other systems are also in hand or planned and a pattern of global communication is emerging; transcontinental systems must interconnect ocean cables at a number of points, but the role of inland systems generally and especially in under-developed areas is to extend the global system rather than to form an integral part of it.

The Next Stage

The current supremacy of repeatered submarine cables will soon be challenged by developments in communication via earth satellites; this would provide "real-time" television circuits as well as telephony and telegraphy. However, neither the Commonwealth nor the United States is cutting down on its plans for an ocean cable network. Inspired by the technical challenge, each is thinking of what more is possible at the next stage of development. As far as the Commonwealth is concerned, this might well be a system providing a bandwidth of at least 750 kc/s in each direction over some 2,000 miles. With suitable development effort on terminal equipment whereby redundant picture information is reduced or eliminated, such a system might also provide a "real-time" television service.

Financial Section

STOCKS and SHARES

THE gilt-edged market of the Stock Exchange had another good week, with prices of many Government issues adding another point or so to the already quite substantial gains established since the small cut in Bank Rate at the beginning of the month. Special favour was shown to the medium-dated issues such as the 3 per cent British Electricity stock 1968/73 which, at a price of 74, offers a current yield of over 4 per cent and guarantees a capital profit of 26 points (or 35 per cent on the money invested) upon repayment in 12 years' time. Industrial shares also received better support. A number of leading electrical issues, including A.E.I., English Electric, G.E.C., Parsons and Reyrolle were showing recoveries of between a shilling and half-a-crown by the beginning of this week.

Price Changes

Aberdare Cables were marked up from 15s to 16s 3d on the report that scrip and "rights" issues are to be announced shortly: the interim dividend is unchanged at 7½ per cent. Plessey at 40s were in renewed favour while awaiting news of the outcome of the share-exchange offers to Ericsson and Automatic Telephone. Babcock & Wilcox recovered 1s 3d of the previous week's setback on the passing of the interim dividend and Tube Investments regained 2s 6d of earlier losses, reaching 57s 6d. Elsewhere, Dimplex were quoted "ex" the two-for-three scrip issue. They rose 2s to 52s in response to the chairman's confirmation that the increase in this year's dividend would have been larger in the absence of Government pleas for restraint, and his indication that normally be liked to see shareholders enjoying a proper share of the company's success.

B.E.I. Prospects

In his annual review accompanying the full report of British Electronic Industries (the Pye-Ekco merger), Mr. C. O. Stanley gives a confident account of the future which lies before the group's broad interests in fields other than domestic television. He was unable however to offer hopes of an early emergence from the latter's difficulties, or to say how these would affect profits in the current year. For the moment this short-term problem

seems to be the larger factor as an influence on the 5s shares, which subsequently eased further to 10s 9d. As already known, the Ekco member of the group incurred a loss of £665,000 in the last year, and Pye's profit of about £1½ million provided narrowly

for the payment of the 15 per cent distribution. A yield of 7 per cent on the shares at their present price is evidently related more to uncertainty about immediate dividend prospects, and perhaps also to the £8·7 million overdrafts, than to the big long-term

Price Changes in

Company or Board	Nom. Value	Middle price 23rd Oct.	Rise or Fall	Week's		Dividend		1961		
				Pre- vious	Last	Yield %	High- est	Low- est		
<i>Gilt-edged Stocks</i>										
Brit. Elec. 1968/73	...	100	74	+1	3	3	4 1 0	75½	70½	
Brit. Elec. 1974/77	...	100	68	+1	3	3	4 8 3	70½	64½	
Brit. Elec. 1976/79	...	100	69	+½	3½	3½	5 1 6	73½	67	
Brit. Elec. 1974/79	...	100	77½	+½	4½	4½	5 9 9	82	75	
Brit. Elec. 1967/69	...	100	90½	+1	4½	4½	4 19 6	91½	86	
<i>Overseas Electric Supply</i>										
Calcutta Elec.	...	£1	21/3		7½	7½	11 11 0	22/3	20/6	
East African Power	...	£1	13/-		8	10	15 7 9	15/-	13/-	
Nigerian Elec.	...	£1	19/-		10	14	14 14 9	19/9	15/6	
Perak Hydro-Elec.	...	£1	20/6	-1/6	15	15	14 12 9	23/6	17/6	
<i>Electrical Shares</i>										
Aberdare Holdings	...	5/-	16/3	+1/3	17½	17½	5 7 9	17/-	14/3	
Aerialite	...	1/-	4/3	-6d	54	40	9 8 3	8/-	4/3	
Allen, W. H.	...	£1	26/-	-1/-	14	10*	7 13 9	42/6	26/-	
Allied Insulators	...	5/-	8/6	-3d	20	10*	5 17 9	10/-	8/-	
Alwyn Holdings	...	5/-	21/-		12½	15½*	3 11 6	22/3	16/6	
Anglo-Portuguese Tel.	...	£1	19/9	-3d	9	9	9 2 3	25/-	18/9	
Arcolectric	...	1/-	4/6		15	15	3 6 9	6/-	3/9	
Aron Meters	...	5/-	27/-	-3/-	15	15	2 15 6	30/-	17/-	
Assoc. Elec. Ind.	...	£1	30/3	+1/6	15	15	9 18 3	48/6	28/9	
Automatic Tel. & El.	...	5/-	17/3	+3d	17	17	—	20/-	12/9	
Babcock & Wilcox	...	£1	21/6	+1/3	9	9	—	36/6	19/-	
Bakelite	...	10/-	46/3		17½	17½*	3 15 9	60/-	42/-	
Baldwin, H. J.	...	2/-	1/-		10	Nil	—	1/9	1/-	
Berry's Electric	...	5/-	56/6	-1/-	30	33½*	2 18 9	57/6	37/-	
Bowthorpe Holdings	...	2/-	8/-		18½	22	5 10 0	10/3	7/9	
Brit. Elec. Resistance	...	2/-	6/9		17½	17½*	5 3 9	8/9	6/6	
Brit. Elec. Traction:										
Def. Ord. "A"	...	5/-	49/-	+6d	40	50	5 2 0	57/6	41/9	
British Electronic Ind.	...	5/-	10/9	-6d	—	15	6 19 6	15/3	8/9	
B.I. Callender's	...	£1	55/6	+6d	13½	13½	4 17 0	62/3	49/6	
B.I. Callender's 6% Pref.	...	£1	16/6		6	6	7 5 6	18/3	16/6	
British Thermostat	...	5/-	30/9		20	27½	4 9 6	40/-	28/-	
Brook Motors	...	10/-	51/3		25	25*	4 17 6	55/-	47/-	
Bulgin, A. F.	...	1/-	12/3		55	40*	3 5 3	13/3	7/9	
Bulpits	...	5/-	16/9	-3d	15	16½	4 17 0	27/6	16/9	
Burco Dean	...	5/-	6/9		18	15	11 2 3	11/9	6/3	
Cable & Wireless	...	5/-	17/3	+1/-	10	10*	2 18 0	19/9	12/6	
Cambridge Instruments	...	5/-	31/-	-6d	12½†	22	3 11 0	38/6	30/-	
Chloride El. Storage "A"	...	£1	75/-		17½	20	5 6 9	91/-	72/-	
Clarke Chapman	...	£1	40/-		13½	13½	6 17 6	54/-	37/6	
Clarke, T.	...	2/-	4/-		16	16	5 6 9*	5/3	3/6	
Combined Elec. Mfrs.	...	4/-	7/-		—	12½	7 2 9	10/-	6/9	
Contactactor Switchgear	...	5/-	13/-		14	14	5 7 9	16/-	12/9	
Crabtree	...	10/-	23/6		20	12½*	5 6 6	33/9	23/6	
Crompton Parkinson	...	5/-	11/6	+3d	14	12½*	5 8 9	14/6	11/3	
De La Rue	...	10/-	47/-	-2/3	22½	22½*	4 15 9	70/-	47/-	
Decca "A"	...	10/-	55/6	+6d	23½	23½	4 4 0	70/-	52/3	
Desoutter	...	5/-	55/-		30	35	3 3 9	68/9	49/-	
Dewhurst	...	2/-	5/6		20	20	3 12 9*	6/6	3/9	
Dictograph Tel.	...	2/-	10/6		20	20*	3 16 3	13/-	8/6	
Dimplex	...	5/-	52/-x.c.	+2/-	30	35*	2 0 3*	52/3	28/3	
Dubilier Condenser	...	1/-	2/-		30	15*	7 10 0	3/-	2/-	
Dupont	...	5/-	10/6		17½	20	6 7 0*	17/-	10/6	
E.M.I.	...	10/-	37/-		17½	17½	4 14 6	51/3	35/3	
Eleco	...	2/-	8/3		20	20*	4 17 0	10/6	4/3	
Electrical Apparatus	...	5/-	20/-	+1/6	20	22	5 10 0	21/-	17/-	
Electrical Components	...	5/-	9/-		11½	12½	6 19 0	9/9	7/9	
Elec. Construction	...	£1	21/-	-3d	9	5	4 15 3	39/-	20/3	
Elliott-Automation	...	5/-	35/-	+9d	9½	13	1 18 0	37/6	25/6	
Enfield Rolling Mills	...	£1	37/6		15	15	8 0 0	51/6	37/6	

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

* After scrip issue.

† Free of income tax.

‡ Dividend indicated.

expansion potentialities outlined in the chairman's statement.

Sale of Solartron

News of Firth Cleveland's agreement to sell their controlling interest in the Solartron Group had a rather mixed

reception in the market, where the company's 4s shares were at first marked down from 28s to 24s 3d. It was appreciated that on the one hand the proceeds of a little under £2 million would at least go far to solve the immediate financial problem of the com-

pany, and that the deal would produce a capital profit of something over half a million. Also, Solartron has so far made a negligible contribution to group profits. On the other hand, the sale would evidently mean the loss of an interest which has been regarded as having outstandingly promising long-term possibilities.

K.G. Holdings

It was announced a few months ago that K.G. (Holdings) intended to offer to shareholders a direct interest in the F. H. Wheeler subsidiary, and the chairman says now that full information about this firm will soon be given in connection with its establishment as an independent public company with a Stock Exchange quotation for its shares. In his annual review Mr. Wheeler expressed some disappointment with the K.G. group's 1960-61 results but told shareholders that if profits in the second half of the current year were as good as those for the first six months, there would be a considerable improvement in the accounts for the full period. The 35 per cent dividend paid for 1960-61 produces a yield of 8 per cent.

Muirhead Dividends

A yield of little more than 2 per cent on the 5s shares of Muirhead & Co., quoted at 24s 3d, evidently reflects a confident assessment of the scope for growth in the company's specialised business, and of future dividend prospects. On the latter subject the directors' recently published progress report said that out of deference to the Chancellor's appeal for restraint no increase in the interim dividend for the year ended last month had been considered. The 2½ per cent payment is the same therefore as for last year, when the total was brought up to 10 per cent from earnings of more than three times that rate.

Company News

Electrical Apparatus 5s shares were raised to 20s after the announcement of a 32 per cent expansion in profits (before tax), an increase in the dividend from 20 to 22 per cent, and a proposed 100 per cent scrip issue. There is now a yield of 5½ per cent on the shares. Shareholders of Aerialite had been warned in May that as a result of difficult conditions for both cable and television business, lower earnings were in prospect. The extent of the fall in profits to little more than half the 1959-60 level, and of the reduction in the dividend from a total of 54 to 40 per cent, appeared nevertheless to have been rather larger than expected, for the price of the 1s shares was lowered further to 4s 3d. The yield is now nearly 9½ per cent.

Electrical Investments

Company or Board	Nom.	Middle Value 23rd Oct.	Rise or Fall	Week's Dividend		Yield %	1961	
				price	Previous		High- est	Low- est
<i>Electrical Shares—continued</i>								
English Electric	£1	28/9	+2/6	10	10	6 19 3	40/9	26/3
English Electric 3½% Pref.	£1	10/3	+6d	3½	3½	7 13 9	11/9	9/9
Ericsson	5/-	30/3	+9d	13†	13†	—	32/-	22/3
Ever Ready	5/-	37/-	+9d	20	22½	3 2 0	40/-	31/6
Falk Stadelmann	£1	21/9	—	10	7½	6 18 0	26/-	21/9
G.E.C.	£1	25/3	+1/-	10	10	7 18 6	39/6	24/3
G.E.C. 6½% Pref.	£1	16/6	—	6½	6½	7 17 6	19/3	16/6
General Cables	5/-	4/9	—	15	Nil	—	6/3	4/9
G.H.P. Group	£1	19/6	-6d	6	7½	7 0 0	24/6	17/-
Goblin (B.V.C.)	5/-	4/6	—	12½	10	11 2 0	8/6	4/3
Hackbridge Holdings	5/-	5/3	-6d	20	10*	9 10 6	6/9	5/-
Harland Engineering	5/-	12/-	—	16	16	6 13 3	19/-	12/-
Head Wrightson	5/-	21/-	-1/-	14	16	3 16 3	30/-	21/-
Heatrae	2/-	15/6	+6d	12½	25	3 4 6	19/-	12/6
Holophane	5/-	16/9	—	30	30	8 19 0	20/6	14/6
Hoover	5/-	51/3	+1/3	90	45*	4 7 9	55/6	37/6
Hunt, A. H.	4/-	17/6	—	20	20	4 11 6	25/9	17/6
Intl. Combustion	5/-	23/-	—	30	30	6 12 0	33/9	23/-
Intl. Computers & T.	£1	90/-	+3/9	10	11½	2 10 0	107/-	59/-
Johnson & Phillips	£1	20/-	-3d	Nil	5	5 0 0	24/-	17/6
Kenwood Mfg.	1/-	3/3	—	—	—	—	6/-	3/3
Laurence Scott	5/-	14/3	—	15	15	5 5 3	18/9	14/3
Lister, R. A.	£1	49/6	+9d	14	14	5 13 0	56/9	45/6
Lucas, J.	£1	50/-	-1/3	12½	13½	5 10 0	71/6	50/-
Marryat & Scott	2/-	16/9	—	27½	32½	3 17 6	18/6	13/9
Mather & Platt	£1	36/-	—	11	11	6 2 3	51/6	36/-
Metal Industries	£1	47/-	-6d	15	15	6 7 9	66/6	47/-
Midland Elec. Mfg.	£1	53/9	—	12	12	4 9 3	67/6	53/9
Murex	£1	37/6	-1/3	20	13*	6 18 3	51/6	38/9
Newman Ind.	2/-	7/-	—	12½	15	4 5 9	7/6	5/-
Oldham & Son	1/-	2/9	—	17½	17½*	6 7 3	3/-	2/3
Parsons, C. A.	£1	49/6	+2/-	9½	12½	5 1 0	72/6	46/9
Philips' Lamps	Fl.10	215/-	+10/-	16	16*	1 9 9	£13½	£9½
Plessey	10/-	40/-	+1/6	17	15*‡	3 15 0	45/-	35/3
Pullin Group	2/-	10/-	—	25	25	5 0 0	15/-	10/-
Pyrotexan	5/-	41/3	—	40	45	4 2 0*	48/9	34/9
Radiation	£1	23/-	—	12	10	8 14 0	37/6	23/-
Reliance-Clifton	5/-	18/3	-6d	15	20	3 13 0*	22/-	14/9
Reyrolle	£1	39/-	+1/6	17½	9½*	5 0 0	51/6	36/6
Richardsons Westgarth	10/-	4/3	—	8½	Nil	—	8/3	4/3
Sangamo Weston	10/-	20/9	-1/-	13½	10½*	4 16 6	25/9	18/9
Scott, James	5/-	30/-	—	25	27½	4 11 9	32/-	25/6
Simon Engineering	5/-	34/9	-1/6	—	27½	3 19 3	43/9	28/-
Smith (England), S.	4/-	13/9	-3d	17½	20	5 16 3	23/9	13/9
Southern Areas	£1	17/-	-6d	5	6	7 1 3	23/-	14/6
Strand Elec.	5/-	17/-	-9d	14-6	20	5 17 9	20/-	12/3
Sturtevant	5/-	9/3	+3d	15†	13†	11 9 0	18/6	9/-
Sun Elec.	5/-	14/3	—	15	18½	6 9 6	17/6	14/3
T.C.C.	10/-	41/3	—	35	22½*	5 9 0	43/9	40/-
Telephone Rentals	5/-	26/3	-6d	15	15½*	2 17 3	29/6	18/6
Thompson (John)	5/-	13/-	+3d	20	5	—	16/9	12/9
Thorn Elec.	5/-	57/6	—	25	25	2 3 6	63/-	44/6
Thornycroft	4/-	5/-	—	6	6	—	7/-	5/-
Tube Investments	£1	57/6	+2/6	—	14	4 17 3	85/-	55/-
Ultra Electric	5/-	19/-	+3d	20	25	—	31/3	12/6
Walsall Conduits	4/-	10/-	—	15	15	6 0 0	15/-	10/-
Ward & Goldstone	5/-	28/-	—	35	17½*	3 2 6	36/6	25/6
Watford	2/-	6/6	—	25	20*	6 3 0	10/9	6/6
Westinghouse	£1	25/9	+9d	11	11	8 10 9	45/-	25/-
West, Allen	5/-	10/6	—	12½	13½	6 8 6	14/6	10/3
Wilkins & Mitchell	5/-	8/9	—	21	12	6 17 3	15/3	8/9
Wolf Electric	5/-	12/9	—	12½	13½	5 7 9	17/6	12/9

REPORTS and DIVIDENDS

British Electronic Industries, Ltd.—In his first statement as chairman of the company, which was formed last year for the merging of Pye, Ltd., and E. K. Cole, Ltd., Mr. C. O. Stanley says that the foundations built by the company in industries other than domestic television are so broad and have such great possibilities "that anything we have done in the past will be small compared with what we will do in the future."

So far as domestic television interests are concerned the outlook is uncertain but once the present situation is cleared up, he says, the TV set business of any company in the group will be run at a profit.

In other divisions of the group the outlook is more clearly defined. The design of Ekco's airborne radar equipment has undergone a radical change and production, which was interrupted by a move from Malmesbury to Southend, will now be profitable. Other profitable activities of Ekco are in the nuclear field and in plastics.

Profits from the Telephone Manufacturing Co. in the seven months since it became a subsidiary of Pye were £200,000 and a substantial increase has been budgeted for in the current year. The largest development is in the Pye scientific instrument division, which is expected to make more than £500,000 profit in the current year.

K.G. Holdings, Ltd.—The chairman, Mr. P. R. V. Wheeler, in his annual statement, says that if the results of the half-year to date were repeated in the second six months, the profits would considerably exceed those for the year ended 31st March, 1961. The group is to follow a policy of "reinforcing success" and profits ploughed back into the business will continue to be employed to this end. Mr. Wheeler refers to the decision, already announced, to establish the subsidiary F. H. Wheeler as an independent public company with its own Stock Exchange quotation. After this operation K.G. (Holdings) will still control 87½ per cent of the equity and "therefore have every reason to foster the company's expansion and future development."

Group profits, before tax, for the year ended 31st March last of £355,385 are comparable with the combined Modern Engineering Developments and K.G. (Holdings) profit of £380,596 previously. The balance sheet at 31st March showed a doubling of net assets to £1,507,000 with an overdraft up from £168,000 to £457,000. Since

then, however, the group has not only arranged to obtain finance through the sale of part of the equity of F. H. Wheeler & Co. but has sold W.S. Electronics to Ultra Electronics for £125,000 cash.

Dimplex, Ltd.—At the annual meeting Mr. E. J. Wade, chairman, said it was too early to make any further forecast of current year prospects beyond mid-September, in which period orders received were up on last year. Stiffer competition must be expected in the current period. Shareholders must not expect miracles but when dividend restraint ended they would have their full share of the profits.

Firth Cleveland to Sell Solartron Interest.—Firth Cleveland, Ltd., has accepted a cash offer from Schlumberger, Inc., of America, for its 56·7 per cent holding of the ordinary share capital of the Solartron Electronic Group, Ltd. Treasury consent has been given to the sale. The purchase consideration will be £1,927,940, or £1 8s 4d cash for each share, including new shares, equivalent to £4 5s per existing Solartron ordinary share. This compares with the £3 a share offered by Firth Cleveland for the outstanding shares not held by them last August. At that time most of the directors of Solartron and their families refused the offer as not being high enough; those shareholders who did accept will be given an *ex gratia* payment by Firth Cleveland making good the difference between the two prices.

Provided the agreement becomes unconditional, S. G. Warburg & Co., on behalf of Schlumberger, will make an offer to holders of the remainder of Solartron ordinary as soon as possible after the capitalisation, and in any event by 1st December, 1961, at the same price of £1 8s 4d per share on the increased capital.

J. & F. Stone Lighting & Radio, Ltd.—Group net profits increased from £386,269 to £420,969 for the year to 30th June last. The dividend is unchanged at 35 per cent with a final of 22½ per cent.

Plans are announced for the formation of a property holding company, and for a free issue of its shares to Stone members. The directors state that, having regard to the increasing need to invest in properties for the development of trading activities, they consider that the best interests of holders may well be served by the formation of such a company, which in the first instance will take over the

group's freeholds. They hope that at the annual meeting to be held on 30th November plans will be sufficiently advanced to enable them to indicate an issue of the property company shares to existing holders by way of a free bonus issue.

The Electrical Apparatus Co., Ltd.—reports higher profits for the year to 31st July last and is raising its dividend by 2 per cent to 22 per cent with a final payment of 14 per cent. A one-for-one scrip issue is proposed for holders of the existing £562,648 ordinary. The group net profit, subject to audit, is approximately £183,000 against £143,586, after allowing £177,000 (£127,565) for taxation.

Bruce Peebles and Belmos.—Hambros Bank announces that the offer made on behalf of Bruce Peebles & Co., Ltd., for the preference and ordinary capital of the Belmos Co., Ltd., has been accepted to the extent of 100 per cent of each class of capital. The offers have therefore been declared unconditional.

Aerialite Dividend Cut.—The final dividend of 25 per cent recommended by Aerialite, Ltd., compares with 34 per cent last year and makes the total for 1960-61 40 per cent (against 54 per cent). Group profits contracted from £274,902 to £147,386 and after tax of £66,257 (£115,460), the net profit of £81,129 compares with £159,542.

Perak River Hydro-Electric Power Co., Ltd.—The directors report that revenue from the sale of electricity increased significantly during 1960-61, reflecting the removal of restrictions on tin production on 1st October, 1960. It has therefore been decided to install two additional 20 MW generating sets at the Malim Nawar station, subject to the Malayan authority's consent. The net profit for the year was £407,340 (against £295,051) and the total dividend is maintained at 30 per cent.

T. Clarke & Co., Ltd.—Interim dividend of 6 per cent against the equivalent of 5½ per cent after allowing for scrip issue.

Ever Ready Co. (Great Britain), Ltd.—Interim dividend 5 per cent (the same).

Edwards High Vacuum, Ltd.—Interim dividend of 5 per cent on the ordinary share capital, as increased by the rights issue made in August last.

Blaw Knox, Ltd., are reducing their interim dividend from 10 to 5 per cent.

Reliance-Clifton Cables & Industrial Products, Ltd.—Interim dividend 8 per cent (the same).

New Companies

Langney Electronics, Ltd.—Registered 25th September. Capital £100. Electronic and automation engineers, etc. Directors: R. E. E. White and Jean R. White. Secretary: Mary L. Carden. Regd. office: 25, Church Street, Eastbourne.

Bobrich (Manufacturing), Ltd.—Registered 21st September. Capital £10,000. Domestic, industrial and labour saving and all other kinds of electrical appliance and device engineers, etc. Regd. office: 66, Queen Street, E.C.4.

King's Electronics (Walthamstow), Ltd.—Registered 22nd September. Capital £1,000. Directors: A. S. W. King, D. R. Keeble (secretary), and S. M. Kalinsky. Regd. office: 8, Cavendish Place, W.I.

Richmond Electronics (Markyate), Ltd.—Registered 22nd September. Capital £1,000. Directors: A. F. Richmond, H. W. Hart and B. H. Hart. Secretary: J. Hillier. Regd. office: Hicks Road, Markyate, St. Albans, Herts.

J.A.T. Appliances, Ltd.—Registered 14th September. Capital £100. Manufacturers of and dealers in all kinds of domestic appliances including washing machines, etc. Directors: J. A. Thwaites (secretary), 59, Stanley Avenue, Greenford, R. H. Oliver and G. Yurgit.

Oxford Instrument Co., Ltd.—Registered 28th September. Capital £100. Designers, manufacturers of and dealers in electrical apparatus, etc. Directors: M. F. Wood and Kathleen A. Wood (secretary). Regd. office: 33, Gutter Lane, E.C.2.

Ericson Electrical Co., Ltd.—Registered 29th September. Capital £3,000. Manufacturers of and dealers in electrical goods of all kinds, etc. Directors: E. P. Mendoza and Muriel Mendoza. Secretary: Sylvia Carson. Regd. office: 141, High Street, Risipin, Mdx.

E. R. Wilshire, Ltd.—Registered 2nd October. Capital £100. Manufacturers of and dealers in electrical goods and equipment, etc. Directors: E. R. Wilshire and Margaret F. Wilshire (secretary). Regd. office: 19, Pitsford Street, Birmingham, 18.

Smith & Co. (Carlisle), Ltd.—Registered 29th September. Capital £25,000. To acquire the business of electrical engineers carried on by J. C. F. Smith and G. W. Smith at Carlisle as Smith & Co., etc. Directors: G. W. Smith (chairman) and J. C. F. Smith. Secretary: Mary Jefferson. Regd. office: Junction Street, Carlisle.

L. G. Woollett & Co., Ltd.—Registered 29th September. Capital £500. Electricians, etc. Directors: L. G. Woollett, R. Day, C. F. Lockwood and A. A. Denny (secretary). Regd. office: Outer Temple, 222-225, Strand, W.C.2.

Mectron (Sales), Ltd.—Registered 12th September. Capital £100. Manufacturers of electrical and scientific apparatus, etc. Directors: H. E. Ascoli and H. B. Shaw. Regd. office: Henrietta House, Henrietta Place, W.I.

Moflash Co., Ltd.—Registered 26th September. Capital £100. To acquire the business of electrical equipment manufacturers carried on in Birmingham, etc. The subscribers are E. B. Gibson and the Silvafame Co., Ltd. Secretary: E. N. Oliva. Regd. office: 72-73, Warstone Lane, Birmingham, 18.

Leyton Instrument Co., Ltd.—Registered 5th October. Capital £100. Manufacturers of and dealers in scientific, electrical, electro-acoustic, electro-mechanical, electronic and other instruments, etc. Directors: K. W. Johnson and G. W. Bussell. Secretary: Margaret E. Johnson. Regd. office: 33, King Street, E.C.2.

Couper Electrical Sales, Ltd.—Registered 3rd October. Capital £100. Importers, exporters, manufacturers of and dealers in electrical, mechanical, refrigeration, heating and air-conditioning apparatus, etc. Solicitors: McKenna & Co., S.W.1. Regd. office: 12, Whitehall, S.W.1.

Export Supplies (Staines), Ltd.—Registered 2nd October. Capital £1,000. Exporters and

importers of electrical and mechanical goods and equipment, etc. R. J. Bolton is the first director. Secretary: J. Bartlett. Regd. office: Fairfield House, Fairfield Avenue, Staines.

W. C. Wynn, Ltd.—Registered 3rd October. Capital £1,500. Electrical and radio engineers and contractors, etc. Directors: W. C. Wynn, Mrs. Muriel E. Wynn and G. C. Wynn (secretary). Regd. office: 2, Station Square, Flitwick.

Peter Smailes, Ltd.—Registered 3rd October. Capital £3,000. Electrical engineers, etc. Directors: P. C. Smailes and Freda K. Smailes. Secretary: V. C. Cochran. Regd. office: 2, Bramble Road, Southsea.

Abacus Electronics, Ltd.—Registered 17th October. Capital £100. Solicitors: Sweystone Walsh & Co., 3, Pump Court, E.C.4.

Needhams Electrical (Loughborough), Ltd.—Registered 17th October. Capital £100. Secretary: Miss P. Smith. Regd. office: 14, Market Street, Loughborough, Leics.

A. W. Burgess, Ltd.—Registered 18th September. Capital £100. Radio, electrical, television engineers, etc. Directors: A. W. Burgess and Margaret Burgess (secretary). Regd. office: 77/79, Woodchurch Lane, Birkenhead, Ches.

P. J. Colton, Ltd.—Registered 17th October. Capital £1,000. Electrical engineers and contractors, etc. Directors: P. J. Colton, 10, Maple Grove, Breaston, Derbyshire, and A. E. Flux, 1, Glebe Rise, Littleover, Derby.

Reid & Co. (Electrical), Ltd.—Registered 18th September. Capital £1,000. Electrical engineers, etc. Directors: C. H. Reid and E. Williams. Regd. office: Everton House, Water Street, Abergavenny, Denbighshire.

Winding-Up Petition

Byfleet Electronics, Ltd.—A petition has been presented for the winding up of the company and is to be heard in the High Court on 30th October. Anyone wishing to appear should notify Samuel Tonkin & Co., 3, Berners Street, London, W.I.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates stated:—

11th November

Ampli-cy. No. 816,027. Class 9. Automatic regulating apparatus for controlling voltage and frequency in dynamo electric machines.—Houchin, Ltd., Garford Works, Ashford, Kent.

Euophon. No. 818,095. Class 9. Electronic apparatus and instruments; apparatus for recording and reproducing sound, etc.—European Radio & Television, Ltd., 18 & 21, Corsham Street, London, N.1.

Metallux. No. 818,459. Class 9. Electrical resistances. **Semics.** No. 820,352. Class 9. Semiconducting devices.—Plessey Co., Ltd., 1, Broad Street Place, E.C.2.

Wofa. No. 820,900. Class 9. Electro-technical apparatus and instruments, etc.—Veb Farbenfabrik Wolfen, Germany. Address for service: H. A. L. Venner, 1, Great James Street, Bedford Row, London, W.C.1.

Adup. No. 822,329. Class 9. Connectors for electric wires and cables.—Jackson Brothers (London), Ltd., Kingsway, Waddon, Surrey.

Constructa. No. 820,939. Class 11. Water heating, air conditioning and clothes drying apparatus.—Maschinenfabrik Peter Pfenning'sberg G.m.b.H., Germany. Address for service: Gill, Jennings & Every, 51/52, Chancery Lane, London, W.C.2.

Kangol-Air. No. 822,691. Class 11. Electrical appliances (not machines) adaptable for use as hair dryers or as space heaters.—

Liquidation

Winding-up proceedings or liquidations are often undertaken for the purpose of reconstruction, the transfer of a business, or other reasons. The appearance of a company's name under this heading therefore does not necessarily indicate insolvency.

Wildon & Co., Ltd., electrical appliance retailers, 449, Hyde Road, West Gorton, Manchester, 12.—Winding up voluntarily. Liquidator, Mr. J. A. Freeman, of Horsfield & Smith, 8, Manchester Road, Bury, Lancs., appointed by members and creditors on 4th October.

Winding-up Orders

Davis Bros. (Electrical), Ltd., 1, Vernon Road, Romford, Essex.—Winding-up order made 9th October.

Eden Electrical Co., Ltd., 77, Croydon Road, Beckenham, Kent.—Winding-up order made 9th October.

Warden Electrics, Ltd., Neville House, Waterloo Street, Birmingham, 2, formerly of 130, Monument Road, Ladywood, Birmingham, 16.—Winding-up order made 9th October.

Bankruptcies

M. C. Cornish, lately carrying on business at 1, Kipping Lane, Thornton, Bradford, electrical dealer.—Receiving order made 13th October on debtor's petition.

J. W. Carrington and R. A. Fenn, carrying on business in partnership as Carrington & Fenn at 25a, Angel Hill, Bury St. Edmunds, Suffolk, electrical contractors and retailers.—Trustee, Mr. R. A. Paterson, Archdeacon's House, Northgate Street, Ipswich, appointed 10th October.

L. Filby and G. D. Brown, lately carrying on business in co-partnership as Filby & Brown, at 44, Park Street, Brighouse, Yorks., radio, television and electrical engineers.—Supplemental dividend of 2½d in the £ payable at the Official Receiver's Office, 20, North Parade, Bradford, 1.

TRADE MARK APPLICATIONS

Gillone Electric, Ltd., Rockstone Works, Doman Road, Camberley, Surrey.

18th November

Remington Lektronic. No. 803,039. Class 8. Electric shaving instruments.—Remington Rand, Ltd., Commonwealth House, 1-19, New Oxford Street, London, W.C.1.

Grooves. No. B802,119. Class 9. Electric arc welding electrodes.—English Electric Co., Ltd., English Electric House, Strand, London, W.C.2.

Hyperlytic. No. 810,661. Class 9. Electrolytic condensers.—Plessey Co., Ltd., 56, Vicarage Lane, Ilford, Essex.

Selecto. No. B815,927. Class 9. Electrical and electronic apparatus and instruments (not including talking machines or any goods of the same description).—Selecto Corporation, U.S.A. Address for service: Boul, Wade & Tenant, 112, Hatton Garden, London, E.C.1.

Uniplug (design). No. B814,623. Class 9. Electrical plugs and socket outlets.—Uniplug (Proprietary), Ltd., South Africa. Address for service: Frank B. Dehn & Co., Imperial House, 15-19, Kingsway, London, W.C.2.

Compactal. No. 817,560. Class 9. Overhead electrical conductors.—Aluminium Wire & Cable Co., Ltd., Port Tenant Works, Crymlyn Burrows Road, Port Tenant, Swansea.

Unitrane. No. 821,625. Class 11. Heating, ventilating and air conditioning apparatus.—Trane Company, U.S.A. Address for service: Carmael & Ransford, 24, Southampton Buildings, Chancery Lane, W.C.2.

LARGE HOME AND EXPORT ORDERS

AN order worth £231,000 has been received by Associated Electrical Industries, Ltd., for 6.6 kV auxiliary switchgear—104 metalclad compound insulated 350 MVA vertical plug-in equipments—for the new Hazelwood power station of the State Electricity Commission of Victoria. The company is already supplying two 200 MW turbo-generators, main transformers and main 220 kV switchgear for this station.

Two more Simon-Carves, Ltd., electro-precipitation plants have been ordered for the iron and steel industry, at an approximate cost of £350,000. The first is for dealing with fume from two 360-ton open hearth furnaces at the South Works of the South Durham Steel & Iron Co., Ltd., with a total gas volume of about 100,000 c.f.m. at 300°C. The high-efficiency precipitators will clean the gases to 0.04 grain N.c.f. The second order is for five electro-precipitators to remove dust from the discharge end of a sinter strand being installed by Head Wrightson Iron & Steel Works Engineering, Ltd., at the Appleby Frodingham Scunthorpe works. The guaranteed efficiency is 99.3 per cent and the total gas volume will be about 335,000 c.f.m. at 212°F.

The British Transport Commission has ordered another 27 complete main-line diesel railway locomotives. Of these 17 of 1,750 h.p. are to be supplied by the English Electric Co., Ltd., for the North Eastern Region and will be allocated to the Hull area. They are due to be delivered from October, 1962, onwards. The other 10 locomotives, with engines of 1,365 h.p., have been ordered from the Brush Electrical Engineering Co., Ltd. They are for the Eastern Region's services in the Sheffield area, and will be delivered early next year. All these locomotives will have electric transmission.

Laurence, Scott & Electromotors, Ltd., have secured a contract worth more than £500,000 for the supply of electric motors and control gear for use in connection with the manufacture of polythene by a group of four Eastern European countries. Simon-Carves, Ltd., are the main contractors for the production machinery.

For the heating of bearing rings 7in to 12in in diameter, followed by oil quenching, the Hoffmann Manufacturing Co., Ltd., have ordered a continuous furnace capable of treating work at the rate of 80 lb/hr from Wild-Barfield Electric Furnaces, Ltd. The

furnace will be heated by tubular elements of nickel-chromium alloy fed at low voltage from transformers and arranged in two zones to give a total furnace rating of 65 kW.

A Ferranti Atlas computer is to be installed at London University towards the end of 1963 at a cost of approximately £2 million. This is the third Atlas to be ordered. The first production model is at present being assembled at Manchester University and will be available for use early next year. A second has been ordered by the National Institute for Research in Nuclear Science, and will be in operation at Harwell in 1964.

The English Electric Co., Ltd., has received orders worth about £1 million from the Universities of Birmingham, Glasgow, Leeds and Liverpool for its KDF9 high speed data processing system.

An order worth nearly £30,000 for five Autopaster reelstands has been placed with Witton-James, Ltd., Hendon, by West Australian Newspapers, Ltd., Perth.

Four Mirrlees/Brush diesel generating sets of from 1,280 to 3,000 kW have been ordered for power stations in Amman and Jordanian Jerusalem, where an extensive programme of electrification is being carried out. The engines will be run on the surplus fuel oil from local refineries, and it is estimated that £60,000 a year will be

saved, compared with the use of conventional diesel fuel.

Witton-James, Ltd., a subsidiary of the General Electric Co., Ltd., has received from the Goss Printing Press Co. an order for six press driving motor and control gear equipments and six autopaster reelstands for use by France-Soir, Paris. This £90,000 order is a repetition of one already being carried out at the Witton-James Hendon works.

The British Communications Corporation, Ltd., a subsidiary of the Radio & Television Trust, has recently obtained a large contract for the supply of v.h.f. radio transmitter/receivers Type A.40 to the British Army.

A £40,000 contract for 1,500 "Leader" 15T aluminium street lighting columns with fluorescent lanterns for Class "B" lighting has been received by the A.E.I. Lamp & Lighting Co., Ltd., from Harrow Borough Council. This is the first part of a programme to light 150 miles of residential roads in Harrow during the next three years, involving 6,500 columns and lanterns at a cost of approximately £175,000. The lantern has been specially developed for this installation and named after the borough. Optical control is by anodised and electrically brightened super-purity aluminium giving good control over either the two 20 W or two 40 W fluorescent lamps.

C.E.G.B. CONTRACTS

CONTRACTS amounting to over £7.6 million have been placed during the past month by the Central Electricity Generating Board for power stations, transmission lines and transforming stations. They include the following:

Thorpe Marsh power station: 415 V switchgear, switchfuse gear, motor control gear and accessories.—M. & C. Switchgear.

Blyth "B": Heating, lighting and plug point installation for turbine house, boiler house and ancillary buildings.—F. H. Wheeler & Co.

West Burton: Coal handling plant.—Birtley Engineering. Main c.w. pumps and motors associated with Nos. 1-4 500 MW turbo-generators.—Gwynnes Pumps.

Ferrybridge "C": Structural steelwork.—Redpath, Brown & Co. Starting and stand-by boiler feed pumps and motors.—G. & J. Weir. Pre-

liminary site works.—M. J. Gleeson (Contractors).

Drakelow "C": H.p. pipework and valves for unit No. 11.—Aiton & Co. H.p. pipework and valves for unit No. 12.—Stewarts & Lloyds.

Belvedere: General site completion works.—J. Jarvis & Son. 132 kV switchgear.—English Electric Co.

West Thurrock: L.p. pipework, valves, auxiliary pumps and tanks associated with sets Nos. 3 and 4.—Stewarts & Lloyds.

High Marnham: 380/275 kV transformer.—English Electric Co.

Kendal substation: Two 45 MVA, 132/33 kV transformers.—Yorkshire Electric Transformer Co.

Beddington substation: 132 kV switchgear.—English Electric Co.

Whitson substation: Substation superstructure.—Gee, Walker & Slater.

TYPE APPROVED

TEXAS SILICON DIODES

**READILY AVAILABLE AT LOW COST
FOR USE IN ALL HIGH PERFORMANCE EQUIPMENT**

CV7013**CV7040****CV7045****CV7046**

Type	Description	Peak Inverse Voltage P.I.V. (V)	Max. Mean D.C. Forward Current @ 25°C (mA)	Max. Reverse Current @ P.I.V. @ 25°C I_R (μ A)	Max. Reverse Current @ P.I.V. @ 100°C I_R (μ A)
CV7013	Diffused junction silicon diodes housed in the Moly/G* small hard glass, double ended package	400	400	0.2	20
CV7040		150	200	0.1	10
CV7045		200	400	0.2	15
CV7046		600	400	0.2	25

ACTUAL SIZE

- Suitable for automatic assembly on printed circuits because of standard size and shape, and magnetic leads.
- Special Texas MOLY/G* molybdenum-to-hard glass seal gives extra resistance to severe mechanical shock.
- Long leakage path makes the devices particularly suitable for equipment used in industrial conditions and at high altitudes.

- High thermal conductance of molybdenum heat sink maintains junction at lower temperatures and improves reliability.
- Matched thermal expansion of molybdenum and hard glass envelope eliminates differential heat strain.
- The only range of devices of their kind in mass production in this country—now.

UNRIVALLED QUANTITY PRODUCTION EXPERIENCE GIVES TEXAS DEVICES UNCHALLENGED RELIABILITY

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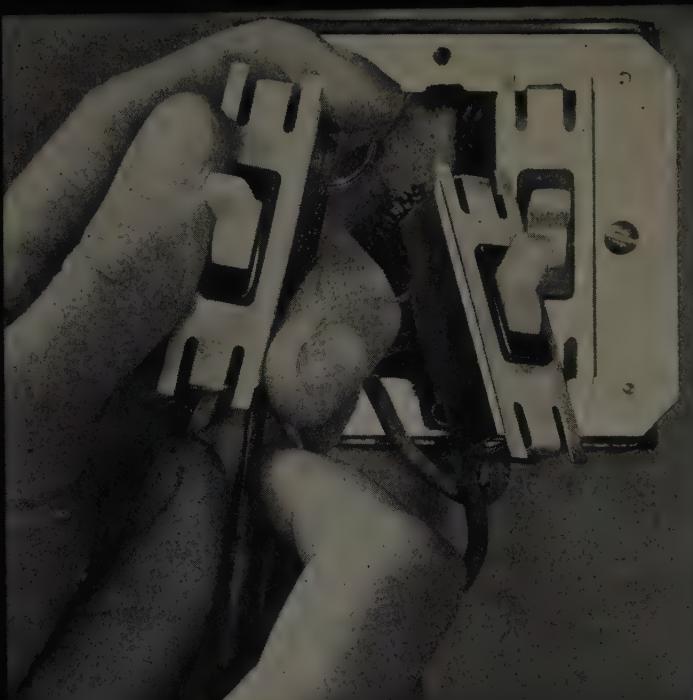
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clip-in a 3-gang switch . . .



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G.E.C. Installation Equipment Group have a *new approach* to designing switches. This makes 'Mutac Clipper' switches unrivalled for ease and speed of installation . . . ensures that these precision-made, electronically-tested switches give a guaranteed long-life performance . . . takes the clicking out of switching. G.E.C.'s *new approach* enables you to put up to 3 'Mutac Clipper' switch units into a standard BS 1299 or plaster depth box. There's a choice of 44 different switch plates—in moulded plastic or metal—and 11 interchangeable switch units fit into just 3 different sized grids and boxes.

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15 amp 1 way S.P.
5 amp 1 way D.P.
5 amp 2 way S.P.
5 amp 2 way & off
5 amp intermediate
5 amp 1 way secret
5 amp 2 way secret
Bell Push
Neon Indicator
Blanking Unit

'Mutac Clipper' switches cost no more than ordinary switches to buy and far less to install—that's a result of G.E.C.'s *new approach*. Complete interchangeability of 'Mutac Clipper' enables you to standardise right through a job.

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INSTALLATION EQUIPMENT

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from wholesalers throughout the
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detailed information ask your
wholesaler for 'Mutac Clipper'
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ELECTRICITY SUPPLY ECONOMICS

Further Notes on the U.N.I.P.E.D.E. Congress

At the 12th U.N.I.P.E.D.E. Congress at Baden-Baden two whole days were devoted to the strictly commercial aspects of electricity supply, including load development, statistics and tariffs. In this second article some of the trends evident in the papers and discussions on these subjects are identified and commented upon

INTERNATIONAL comparisons of rates of progress in different fields of electricity supply and of the varying technical and economic approaches to the large variety of subjects discussed at Baden-Baden are complicated by the allowances that must be made for the special conditions existing in each country. These were mentioned by speakers in one form or another at every session and by far the most important is the influence of the method of generation—hydro, thermal, or mixed hydro and thermal—on the commercial policies of the supply undertakings. This was particularly noticeable in the session on the development of applications of electricity which had for discussion some extremely detailed and interesting papers on the changing pattern of domestic consumption between 1950 and 1959, and on the development of the space- and water-heating loads.

Though the rate at which the major appliances have been installed in Great Britain, and the saturation level achieved in 1959, were lower than in many other European countries, the average annual level of domestic consumption per head in 1959 (1,902 kWh) was second only to Switzerland (2,880 kWh). Total domestic consumption in Britain in 1959 (28,733 million kWh) was more than two and a half times the next highest total, 10,770 million kWh, for Western Germany. A speaker from the Netherlands thought that delegates had much to learn from this high level of domestic consumption in a "thermal" country, and one of the authors, Mr. J. de Felice (Electricité de France), said that in his opinion it was the result of the large consumption by cookers and space heaters, coupled with the fact that these appliances were sold by the electricity supply authorities.

Space Heating Problems

How to cope with the many problems raised by the growing public interest in the use of electricity for space heating is one of the most difficult questions to which supply authorities must find an answer. In certain hydro countries where resources are inadequate there can be no question of promoting electric heating, even by storage methods: in fact electric heating may be actively discouraged. Elsewhere a partial solution is thought to be a move towards all-electric heating. Though not without supply problems this has at least the merit of ensuring regular consumption and could help to check the expansion of supplementary heating which gives rise to the winter peak and because of its low utilisation factor

involves only a small rise in consumption. It is not thought that all-electric heating will give rise to peak-load problems at the generation level, but further investment may be needed in distribution. It is clear from the broad survey of experience in different countries obtained at Baden-Baden that no easy answer, or one with a wide application, is yet forthcoming.

British experience in the development of off-peak heating was well presented by Mr. Eric Bates (North Eastern Electricity Board) and Mr. J. W. Moule (South of Scotland E.B.). It was estimated that there were 20 million kW of space heaters in domestic premises in England and Wales, and a drop of a few degrees in temperature could add 500 MW to the national load. Because of the lower diversity of heaters with more continuous use, it was doubtful if this load was now attractive and it was not being actively promoted by Boards in the South. On the other hand, there were now 75,000 dwellings with storage floor heating either built or under construction.

In the South of Scotland half the houses now under construction were being equipped with off-peak heating, and apart from floor warming, methods of electric heating using hot air, the walls and small-bore hot water systems were being developed. Despite the interest in British progress in this field it would appear that in some countries the level of heating achieved by floor warming would not be up to the required standards and the amount of thermal insulation needed would be too costly. On the other hand, it appears from another study that the emphasis in advertising aimed at new applications of electricity in industry is everywhere on electric heating.

Water heating is another load with an important off-peak potential, but the amount of use made of electric water heating varies widely from country to country. It is most highly developed in Switzerland where, with a mean annual consumption per appliance of 2,000 kWh, it represents 36 per cent of total domestic consumption. With such a widespread use of electric water heating (the saturation level is 53 per cent) difficulty has been experienced with a "peak in off-peak hours" when the heaters are all switched on simultaneously. But arrangements for staggering the switching-on time by zones have made it possible to obtain a fairly regular load curve and a similar degree of staggering can be applied during the mid-day boost.

Swiss studies of the effect on the load of storage water heaters that are permanently switched on have shown that

these tend to accentuate the difference between peak and off-peak loads. On the other hand, Belgian and German experiments indicate a high diversity factor for instantaneous water heaters and a relatively low after-diversity maximum demand compared with the installed load. The Belgian tests were carried out on a block of 41 flats, each with an installed load of 45 kW, including an instantaneous water heater with a double element (3 and 18 kW). The incidence of the peak does not exceed 3 kW per flat. Such heaters obviously require adequate house wiring and minimum voltage circuit-breakers need to be fitted to avoid difficulty in restoring the supply after a power failure. From the undertaking's point of view the ideal method of controlling the water-heating load is obviously by a form of central telecontrol.

Consumption in Industry

If Britain has achieved a high level of domestic consumption, the record on the industrial side is decidedly poor. Much has been made in the past of the difference between the large amount of electricity used by workers in the United States compared with that available to the average British worker. Figures compiled by a working party of the Applications Study Committee show that the kWh consumed per worker in Britain in 1959 (5,900 kWh) was well below the average (7,890 kWh) of fourteen European countries, and compared with 11,000 kWh in Western Germany, 11,600 kWh in Belgium and 24,200 kWh in Sweden. The other countries below the average were Denmark, Ireland, Italy, Jugoslavia, Portugal and Spain. Much interest attaches to the working party's continuing, and necessarily long-term, investigations into the characteristics of the industrial consumption of electricity in different countries because this is a situation which must concern not only the electricity authorities but all those interested in this country's competitive position.

Load Forecasting

As recent experience in this country has emphasised, the forecasting of the future growth of electricity consumption is far from being an exact science. Yet an industry which is expanding rapidly, is highly developed and is a large user of capital is compelled to know a long time in advance the requirements that it will have to satisfy. The introduction of larger generating units obviously reduces the margin for error. The forecasting of the level of consumption and of the types of consumption has been the subject of exhaustive study in many countries and a working party, set up early last year, has prepared a preliminary report on its investigations into the methods being used in five countries, Western Germany, Belgium, France, Italy and Great Britain.

The basis of most forecasts is still the classical method of extrapolating a chronological series of consumption figures. But the future seldom resembles the past and even for medium-term forecasts it is necessary to modify this result by taking into account data relating to the future development of different sectors of the economy. As the author of the report, Mr. J. de Felice, pointed out, it would be of considerable assistance in forecasting the demand for electricity if the past influence of these external variables, the extent to which the relationships would remain valid in the future and the probable future values of these variables could be determined more simply

and with greater accuracy. At a regional level all the undertakings consulted carry out continuous inquiries among large consumers to ascertain their future requirements, and the results of investigations of the markets for the main energy-using appliances give a confirmation of the forecasts of the development of electricity in the corresponding fields.

In several countries also "energy balances" are drawn up which show precise consumption figures for the different forms of energy, particularly in industry, and the trend revealed of substitution of one form of energy for another may serve for forecasting energy consumption. In Italy, France and Belgium this has been taken a stage further by the use of inter-industrial exchange tables drawn up by the Leontief method which is claimed to constitute an extremely effective means of economic forecasting. One result of the Italian study has been to show the large proportion of the total demand for energy which results from the final demand for the products in a small number of sectors of activity, excluding the largest direct consumers of energy.

Much attention has also been given to methods of assessing the uncertainties in forecasts and the risks involved in deviations of demand from the expected trend. Here the author draws attention to the point emphasised by Great Britain that "it would seem prudent to base programmes of construction of power stations not on provisional data provided by a single method, but by comparing the results obtained by several methods the advantages and disadvantages of which can be correctly assessed."

Operational Research

Closely allied to this question of load forecasting is the use of statistical methods by electricity supply undertakings themselves as an aid to more efficient operation. One of the difficulties here is the mental attitude of the engineer which makes him reluctant to use operational research techniques since he believes that he is insufficiently trained for such investigations, while the specialist statistician does not appreciate the fundamentals of the problems involved. A report from the working group on Mathematical Analysis Methods, "Multiple Regression Method Applied to the Analysis of Load Curves," seeks to show that the difficulties facing the engineer are quite small and that the scientific methods described may soon replace the more cumbersome and costly empirical methods now employed. Only an elementary knowledge of statistical mathematics, it is claimed, is often needed, and many multiple regression studies are capable of solution without the use of computers. Nevertheless, a wider application of such mathematical studies, in a more or less mechanised form, is being undertaken in several countries, especially in Britain under the guidance of Dr. P. Schiller (Electricity Council) and in Western Germany.

Other investigations undertaken by the Statistics Study Committee include the optimum operation of systems with mixed thermal and hydro generation, the statistical aspects of such problems as the five-day week and temperature, which affect the consumption of electrical energy, and diversity.

Although it is universally recognised that the electricity supply industry can exist only as the result of the diversity of the demands of consumers, insufficient attention appears

to have been paid to evaluating, in concrete figures, the influence of diversity at the various stages of production, transmission and distribution. Except in a few particular cases, diversity is taken into account solely by applying empirical criteria. The nebulous conclusions of the group studying this problem are in fact a reflection of the state of research into diversity. The study group believes that results of great value could be obtained from more systematic research, but it stresses that this is not exclusively a matter for research departments. "To be fruitful it must be the continuous or regular concern of the system's planning and operational departments and of the commercial departments." The study of diversity, it is concluded, must be considered as a basic activity of operational research.

Accident Statistics

Though there is a lack of compatibility in the electrical accident statistics of different countries, the trends apparent from the report, prepared by Mr. C. W. Orr (C.E.G.B.) and Mr. G. Winter (Austria), are of considerable interest since they represent average values for a population of more than 125 million.

During the period 1952-58 there was a continuous reduction in fatal electrical accidents in industry in the six countries investigated but no improvement in the rate of non-fatal accidents. Outside industry the fatal accident rate did not improve appreciably. The inquiry has shown that 40 per cent of fatal accidents have occurred to people whose work is not concerned with electricity and that two-thirds of the fatal accidents and more than three-quarters of the non-fatal accidents are due to consumers' appliances and installations. This emphasises the importance of educating consumers in the use of electricity.

Tariff Policies

Ultimately, the commercial viability of an electricity supply utility depends on the soundness of its tariff structure. As was pointed out by Dr. F. Boselli (Italy) there was no essential difference in this respect between publicly-owned and privately-owned undertakings, and Mr. H. Meysenberg (Western Germany) added that for both the aim should be not maximum profit but a cheap and reliable supply. Nevertheless, he recognised that profitability was essential if credit was to be obtained.

The expenses involved in providing a supply of electricity are extremely complex, but in general the revenue received from a tariff should be sufficient to cover total costs attributable to supply under that tariff and, moreover, marginal revenue should cover marginal costs. It should also provide an equitable profit on the capital invested. The ways in which these ends can be achieved seem endlessly variable and the main objective of the work of the Tariffs Study Committee is the preparation of a book (with an international authorship) that will explain the principles and the methods upon which tariffs are formulated from the costs of supply. It must be hoped that the completion of this project will not be long delayed since the indications are that the contents will be of high quality. Some preliminary material presented for criticism included an extremely clear analysis of marginal distribution costs and an explanation of the integral method of cost calculation, which provoked a lengthy discussion between advocates of the different systems.

There was also an excellent description by Dr. R. Müller (Italy) of the many criteria—geographical, economic, sociological and judicial—which affect the tariff building and hence load development policies of an electricity supply authority. Tariffs provide great scope for the theorists and though their work may lead to an extension of knowledge it demands judgment in its application. As Mr. C. T. Melling (Electricity Council) said, in commenting on Dr. Müller's paper, one of the greatest benefits to an undertaking was to improve the load factor of utilisation of capital assets. This might lead, in an extreme case, to the provision of a supply at a low initial return in anticipation of greater benefit in the long run. The making of tariffs, Mr. Melling pointed out, "involves not only an accurate knowledge of marginal costs but also commercial judgment on the possible future development of the generation, transmission and distribution systems, incentive to develop new methods and appliances and a vigorous sales and public relations policy to ensure that consumers' purchasing capacity goes in optimum degree to the purchase of electricity instead of to competing fuels and other activities."

SHIPBOARD TRANSFORMERS

THE new British Standard, B.S. 3399:1961, "Transformers for Use in Ships," applies to single-phase and polyphase double-wound power transformers and reactors having windings insulated with Class A, B, H or C materials, rated from 1 kVA to 1,000 kVA and having a rated line-to-line voltage not exceeding 3.3 kV. Both dry and oil-immersed type transformers are specified.

The standard covers transformers suitable for use under specified service conditions depending on whether they are to operate in temperate or tropical climates. Details are given of ratings, terminal markings and external fittings. Temperature rise limits are specified together with full details of the tests necessary to prove the performance characteristics. There are seven appendices and 17 diagrams and figures.

Copies may be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 15s.

Tasmanian Commission's Report

IN its annual report for 1959-60 the Hydro-Electric Commission of Tasmania estimates that the margin of capacity created by the bringing into operation of the Liapootah power station in 1960 will meet the increase in load until the completion of the Catagunya station next year. The period under review was one of steady growth with the peak load on the system rising to a record figure of 412,900 kW (the figure for 1958-59 was 403,600 kW). Total sales amounted to 2,173.5 million kWh, an increase of 4.2 per cent.

The completion of the Liapootah power station led to a reduction in the amount of electrical construction work, but investigation and design activities are proceeding at the usual rate. The system's first 220 kV transmission line, between Waddamana-Burnie and Liapootah-Chapel Street, was inaugurated during the year.

On the retail supply side, the total number of consumers at the end of the year was 117,266, an increase of 2.4 per cent.

NEW ELECTRICAL EQUIPMENT

RE-STYLED 13 A PLUG

A special feature of the new "M.E.M." 13 A plug manufactured by the MIDLAND ELECTRIC MANUFACTURING CO., LTD., Reddings Lane, Tyseley, Birmingham, 11, is the styling of its moulded case which is shaped to permit natural handling with ease of entry and withdrawal, while a finger shield prevents contact with the live pins. The live terminal is fixed to the base and its position allows for wiring without the removal of the fuse. Earth and neutral terminals are of one piece for strength and are held in the base by resilient inserts. Other features include a captive cover screw, adjustable flex grip, and specially shaped pinching screws which prevent cutting of the conductors. In addition to standard brown and ivory mouldings there are also black or white rubber types which possess the same essential features.

MAGNETIC PLASTIC MATERIAL

Ferromagnetic plastic material, marketed under the trade name "Ferrottron," is announced by POLYPENCO, LTD., 68-70, Tewin Road, Welwyn Garden City, Herts. It is a non-memory, inductive core material which can be used up to 350°C. In addition, it is unaffected by moisture and ageing. It has a positive Q coefficient and constant magnetic permeability. High dielectric strength and low dielectric losses are coupled with a volume resistivity higher than $10^{10} \Omega\text{-cm}$. The material is available in flexible rod and tape form and in short segments that can be readily machined for prototype evaluation. Production quantities can be supplied as moulded parts.

FLASH WELDING MACHINE

The BAJ.32/120 flash welding machine recently produced by ELECTRO MECHAN-HEAT, LTD., Manor Works, Ettingshall, Wolverhampton, Staffs., uses "Alligator" clamping with an air/hydraulic system which gives high speed closing of the jaws, after which pressure is built up until a maximum clamping force of 24 tons is achieved. A shaped arm contour makes the machine suitable for use on cylindrical components, such as wheel rims and small barrels. The maximum weld-



Electro Mechan-Heat flash welding machine

M.K.S. Nucleonics C-core transformer clamp

able cross-section is 2.33 sq in. The maximum width of strip which can be accommodated between the arms is 11 1/4 in and at this width cylindrical components down to 13 1/2 in diameter can be welded, while at widths below 4 1/2 in the component's diameter can be as low as 9 3/4 in.

The automatic welding sequence is started by pushbutton from a small desk fitted to the front of the machine. A sequence control unit and an ignitron or magnetic contactor are housed in a separate cabinet. The welding operation, including the movement of the table, can also be controlled manually. There are foot-switches by which each clamping jaw can be closed independently. All areas likely to be affected by weld flash are protected by thick copper screens, from which any steel particles can easily be removed during cleaning.

C-CORE TRANSFORMER CLAMP

The approved method of assembling C-cores in shell-type transformers is to use a steel band which is applied with a known tension, and then solder-

sealed. Another method commonly used for larger C-cores employs a screw-type band, but whichever method is adopted, clamping frames must be used to accommodate a terminal board, and to provide mounting facilities. M.K.S. NUCLEONICS, LTD., Queens Road, Watford, Herts., have patented a dual-purpose clamping frame which, it is claimed, eliminates core banding, automatically locates and lines up the cores, and comprises a small number of separate components. For horizontal mounting with inter-Service fixing centres an inexpensive adaptor plate is available, as are coil shrouding plates.

COMMERCIAL LIGHTING FITTINGS

The range of commercial lighting fittings being marketed by HOLOPHANE, LTD., Elverton Street, Westminster, S.W.1, under the registered name "Louvrelen" consists basically of a concave prismatic glass lens mounted in the circular rim of a metal box for recessing into a ceiling or soffit to provide special highlighting effects.

There are two sizes. The larger

A 2-lamp "Crompack" fitting with glass panel diffuser (Crompton Parkinson, Ltd.)



has a 12in diameter glass refractor and takes a 200/300 W g.l.s. lamp; the recessed box is 13½in high above the ceiling and the weight is 11½ lb. The smaller is for use with 100/150 W lamps and employs a 6in diameter glass with recessed box 9½in high above ceiling, weight 2½ lb. In each size the box is arranged for top cable entry with bridge pieces carrying the lampholder assembly and reflector dimensionally correct for the light centre position of the lamp size specified.

HEARTH TYPE ELECTRIC FIRE

The model 701 electric fire now being produced by R. & A. MAIN, LTD. (Electrical Division), 48, Grosvenor Gardens, London, S.W.1, is a 2 kW hearth type model available with either coal or log effect. It is designed to fit into a standard 16in fireplace and, being constructed in cast iron, is extremely robust. Its two 1 kW elements are separately switched and it is suitable for use on voltages of 200/220 or 230/250. The overall dimensions of the fire are 11½in high by 19in wide by 14in deep (15in including guard). The finish is in copper lustre vitreous enamel and the prices, including purchase tax, are £10 18s 3d (coal effect) and £11 19s 7d (log effect).

DOOR CHIMES

A new range of door chimes costing from 18s 9d to £2 4s 4d, including tax, has been introduced by MORPHY-RICHARDS (CRAY), LTD., 50, Conduit Street, London, W.1. There are four different models in the range, all of which can be operated from batteries or through a mains transformer (price £1). The most inexpensive model is the "Guildford" (price 18s 9d), which produces a double chime and is designed for single door operation. The chime bars are incorporated in an off-white stove-enamelled steel case which measures 7in high by 5in wide by 2½in deep.

The "Exeter" chimes (price £1 2s 4d) provide double-note chimes for the front door and a single-note chime for a back or side door. The chime bars of this model are incor-

porated in the casing which can also accommodate two 4½ V batteries. The casing has the same dimensions and finish as the previous model and has, additionally, a gold-toned coronet emblem.

The "Salisbury" model (price £2 7s 3d) has two burnished aluminium-brass alloy chime tubes fitted to a similar type of case as the "Exeter." The overall height of this model, including the chime tubes, is 35in.

The "Canterbury" chimes (price £2 14s 4d) have a de-luxe finish—



Morphy-Richards door chimes: The "Canterbury" (left) and the "Salisbury" (right) suspended tube models, and the "Guildford" (centre top) and the "Exeter" (centre bottom) self-contained models



Main model 701 hearth type imitation coal fire

rose-grey coloured suspension case in moulded polystyrene with a grained off-white wrap-round panel. This case is 5in high by 7½in wide by 2½in deep and the two chime tubes bring the overall height to 35in. Both the chime tube types provide double-note chimes for the front door and a single-note chime for a second door.

FLUORESCENT FITTINGS

CROMPTON PARKINSON, LTD., Crompton House, Aldwych, London, W.C.2, have introduced a two-lamp "Crompack" fluorescent fitting embodying all the features of the single-lamp type. It is now available in 8, 5 and 4ft lengths and with the addition of reflector, diffuser and diffuser assemblies, in metal and plastic, it has a wide application commercially and industrially. The list prices for the two-lamp fitting, with tubes, range from £7 6s 2d to £20 12s.

SALON-STYLE HAIR DRYER

A salon-style hair dryer suitable for domestic use is now being marketed by MAGICOOK APPLIANCES, LTD., 115/129, Carlton Vale, London, N.W.6. The hood is constructed of "Perspex" and a 400 W heating element is fitted. Warm or cool air is controlled by a drop-cord switch. It can be fitted in any convenient position by means of



Magicook Appliances "Magicair" home hair dryer

an adjustable clamp and the total weight is 12 lb. It is obtainable in colours of sea green or warm pink and the price, including P.T., is £8 10s 7d.

DECORATIVE LIGHTING SETS

A new sub-miniature lighting set (known as "Mini-lites"), available in 20 or 40 lamp strings, has been introduced by ATLAS LIGHTING, LTD., Thorn House, Upper St. Martin's Lane, London, W.C.2. Each of the lampholders is fitted with a plastic petal decoration and a pine cone miniature lamp. Various colour combinations give an attractive effect when illuminated. The sets are contained in an attractive box which has a transparent cover and the lamps appear

operations. Contacts are of beryllium copper. The SKT-34 jack provides a double-turret stud on the reverse side of the chassis for terminating the associated circuitry. The p.t.f.e. body is 0.148 in in diameter, with a 0.172 in diameter above-the-chassis shoulder.

MIXED GAS THYRATRONS

The latest range of valves from ASSOCIATED ELECTRICAL INDUSTRIES, LTD., Electronic Apparatus Division, Lincoln, is designed to combine the advantages of mercury-vapour and gas-filled thyratrons. The valves are filled with inert gas as well as mercury, thus achieving short cathode heating

time and operation within a wide range of ambient temperature. The two types, BT 111 and BT 113, are rated for a maximum peak anode voltage of 1,500 V and maximum cathode currents of 30 and 2 A peak, 2.5 and 0.5 A mean, respectively. The ambient temperature range is -40 to +40°C but, for maximum life, it is recommended that the valves be operated in the range of +15 to +40°C. Cathode heating time is 30 sec for the BT 111 and 10 sec for the BT 113. These thyratrons are intended for industrial applications and the BT 113 can be used as a plug-in replacement for the BT 19 mercury-vapour thyatron.



Atlas "Mini-lites" 40 lamp decoration set

in the form of a fountain spray. They are priced at £1 6s plus 2s 6d purchase tax (20 lamp) and £2 5s plus 4s 3d tax (40 lamp). Spare lamps cost 8½d each plus 1½d tax.

HIGH-SPEED SWITCHING DIODE

The GEX71 germanium gold-bonded diode produced by the G.E.C. SEMICONDUCTOR DIVISION, School Street, Hazel Grove, Stockport, Cheshire, is mounted in a sub-miniature, all-glass case and is characterised by a very fast transient response, making it particularly suitable for use in high-speed switching circuits. The maximum continuous reverse voltage rating is 10 V, the maximum continuous forward current rating is 30 mA and the maximum peak (less than 5 msec) forward current rating is 100 mA. Typical forward voltage drop at 10 mA is 0.45 V.

CLOSED ENTRY TEST JACK

A closed entry test jack designed to receive a 0.032 in diameter probe, to a depth of 0.2 in maximum, is announced by the SEALECTRO CORPORATION, Hersham Factory Estate, Walton-on-Thames, Surrey. The closed entry assures alignment of the probe in test

Miniature Circuit-Breakers

A SERIES of miniature circuit-breakers has recently been introduced in this country by BRITISH BROWN-BOVERI, LTD., 75, Victoria Street, London, S.W.1. The type S 101 breaker, known as the "mini-STOTZ," is a screw-in pattern and has an installation depth of 78 mm in the switched-off position. The breakers can be screwed into any existing 25 A standard Edison E 27 fuse base or a 60 A base if a reducing ring is used. Units are available for operation on supplies up to 380 V a.c. and 250 V d.c. rated from 2 to 25 A. Two main models are available, the type "L" with thermal overload, and instantaneous magnetic releases designed to protect lighting and control circuits, and the type "K" with similar releases, but with characteristics appropriate for the protection of a.c. and d.c. motors or lighting circuits in which larger metal filament lamps or groups of gas-filled lamps have to be switched at full rated current simultaneously.

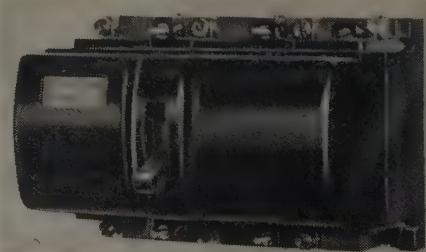
Also announced is a series of high capacity breakers types S 201, S 202 and S 203 in single, double and triple pole forms. These breakers are suitable for 380 V a.c. operation with current ratings from 2 to 25 A and have breaking capacities of up to

12,000 A at 220 V at a power factor of 0.6 for the S 201 and 6,000 A at 220 V at a power factor of 0.6 for the S 202 and S 203. A minimum service life of 20,000 switching operations is expected for the single pole unit, the others having a minimum service life of 40,000 operations. All poles in the S 202 and S 203 units operate simultaneously. Two main versions are again available, the pattern "L" breakers which are designed to protect general circuits and have electro-magnetic releases which permit transient currents of four times the current rating and trip instantly at a maximum of six times the current rating, and the pattern "K" for the protection of power circuits having electro-magnetic releases which permit transient currents of eight times the current rating and trip instantly at a maximum of ten times the current rating.

A further pattern "H" is available for single, double and triple pole designs. These breakers may be used for protection of earthed domestic circuits and where earth circuits of the order of 1.3 Ω serve for the earth return. Under these circumstances circuit-breakers type "H" will trip within 0.1 sec before an earth leakage voltage exceeding 65 V can build up.



Miniature circuit-breakers now available from British Brown-Boveri: type S 101 and (right) type S 203 triple pole high capacity unit



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The English Electric Company Limited, English Electric House, Strand, London, W.C.2.

Generalised Electrical Machine

TO demonstrate the complete range of operating modes of every type of a.c. and d.c. motor and generator a generalised electrical machine set has been developed by MAWDSLEY'S, LTD., Dursley, Glos., in collaboration with Dr. J. E. Brown of the University of Bristol and Mr. J. Kirkham of Oldham Technical College. The set consists of the generalised machine, a d.c. machine, and a torque measuring unit, in addition to an a.c. tacho-generator for measuring rotor speed.

The stator of the generalised machine has a conventional 4-pole a.c. winding in 48 slots. The ends of all 48 coils are brought out to 96 terminals symmetrically arranged in four concentric circles. Thus the stator windings can be connected in either 2- or 3-phase form and, by suitable interconnection of the coils, for several different pole numbers. There is a search coil wound round a single stator tooth.

The rotor of the machine has a 4-pole lap winding in 36 slots. This winding has a set of six symmetrical tappings to both sets, and provision is made for connecting these tappings to four slip-rings in various ways. A search coil round a single rotor tooth is permanently connected to two further slip-rings.

The commutator, which has 144 segments, is equipped with two sets of brush gear and a pair of search brushes. One set of twelve brushes is similar to the racking brush gear of a Schrage motor. Connections to all

twelve brushes are brought out to the terminal panel. A second set of four brushes can be fixed in any desired position, or driven round the commutator at speeds up to 750 r.p.m. by a separate overhung brush-carriage motor. Connections to these brushes are brought out to the terminal panel via slip-rings.

The search brushes with variable span of 0-8 commutator segments can be used to measure voltages between segments at all points round the periphery of the commutator. Scales are provided to permit measurement of the displacement of all brushes.

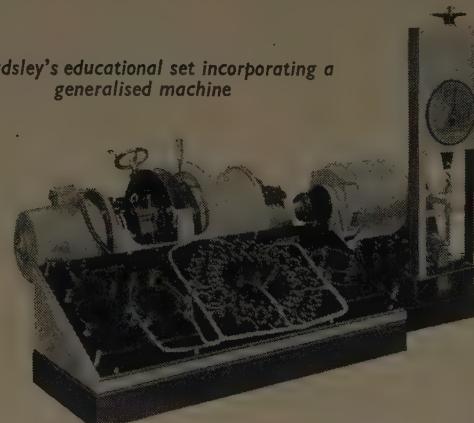
Provision has also been made for shorting together all the commutator bars. This produces a semi-squirrel-cage winding which responds to the various pole numbers which can be produced by the stator winding.

The nominal rating of the generalised

machine as a 3-phase 4-pole induction motor is 4 b.h.p. at 240 V 50 c/s and 1,400 r.p.m. The machine will, however, withstand severe overloads of the type regularly encountered in educational laboratories, and the insulation has been so treated that a maximum winding temperature of 110°C, as measured by a thermocouple, can be tolerated. Provision is made for temperature measurements by a thermocouple and a mercury thermometer.

The d.c. machine may be either a standard machine or a swinging frame dynamometer. The frame of the dynamometer carries the field system and is mounted in pedestal trunnion bearings. A torque arm with a simple reversing linkage is connected at a radius of 0.5 m to a spring balance calibrated in newtons. Movement of the swinging frame is restricted by stops above and below the torque arm.

Mawdsley's educational set incorporating a generalised machine



LIGHTING IN LIVERPOOL

DURING their annual tour of inspection the Liverpool Corporation Lighting and Electrical Committee recently visited a number of public buildings to see work carried out for other Corporation departments. These included Wavertree library (installation of 14in spherical bowl fittings) and Lawrence Road Girls' School (lighting improvement scheme from tungsten to fluorescent). The latter installation is to the Ministry of Education standard for classrooms of 10 lumens/sq ft. Mr. C. C. Smith, city lighting and electrical engineer, explained that the Illuminating Engineering Society standard for school classrooms had recently been raised from 15 to 30 lumens/sq ft and the Ministry was being urged to consider raising its standard for classrooms to at least the old I.E.S. figure.

Interesting street lighting installations seen by the committee included 400 W MBFU lamps in Atlas "Alpha III" lanterns on "New Highway" concrete columns in Lord Street, Liverpool. These are mounted at 35ft and the columns, spaced at 40 yd, incorporate an outlet suitable for decorative lighting. At Abercromby Square, Liverpool, in collaboration with Liverpool University who are redeveloping the area, a more decorative form of street lighting has been installed. This consists of four 40 W fluorescent lamps in Phosco "Phosware" post-type lanterns mounted on 16ft 6in Stanton concrete columns.

Councillor Craine said at the dinner which followed that at 31st March last the department had 31,560 electric lamps and 7,065 gas lamps in use. The

general position of the conversion scheme was that 6,659 electric lamps had been fixed in place of 3,925 gas in six and a half years at a cost of £280,230.

Referring to the possibility of accelerating the conversion, Councillor Craine said he intended to press hard for additional revenue in the form of a 1½d rate for street lighting which would enable the conversion scheme to be completed in six years and most of the main radial roads out of the city converted to sodium in the same period. This month the first phase of the maintenance modernisation plan was being put into operation; this would save £8,000 in a full year, and when extended throughout the city would result in an overall saving of over £25,000 a year.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1956

31077. Furmax Alarm Co., Ltd.—Secret contact-combination switches. 11th October, 1957. (879460.)

33057. Bulpitt & Sons, Ltd.—Thermally controlled electrically heated containers. 29th January, 1958. (879526.)

34016. Associated Electrical Industries, Ltd.—Electrical coaxial transmission lines. 25th October, 1957. (879712.)

1957

394. Electric & Musical Industries, Ltd.—Selective calling systems. 6th January, 1958. Addition to 830464. (879644.)

818. Electric & Musical Industries, Ltd.—Automatic control mechanisms and analogue computing mechanisms therefor. 9th January, 1958. (879714.)

1883. English Electric Co., Ltd.—Electric switchgear. 15th January, 1958. (879567.)

2891. Electric & Musical Industries, Ltd.—Amplitude modulation detector circuits. 27th January, 1958. (879645.)

4040. Dowty Nucleonics, Ltd.—Electrical generators. 3rd February, 1958. (879938.)

4225. Electric & Musical Industries, Ltd.—Electron discharge devices and circuit arrangements embodying such devices. 27th January, 1958. (879569.)

4629. Associated Electrical Industries, Ltd.—Speed control of electric motors. 10th February, 1958. (879928.)

7902. United Kingdom Atomic Energy Authority.—Control circuits. 24th February, 1958. (879939.)

8262. English Electric Co., Ltd.—Connecting means for electrical conductors. 7th March, 1958. (879973.)

9480. Associated Electrical Industries, Ltd.—Laminated transformer cores. 20th March, 1958. (879532.)

9785. English Electric Co., Ltd.—Three-axis pick off position measuring systems. 19th March, 1958. (879533.)

11795. Courtney, Pope (Electrical), Ltd., and E. W. Summers.—Electric lighting installations. 15th April, 1958. (879223.)

14063. Associated Electrical Industries, Ltd.—Tunable resonant structures. 29th May, 1958. (879647.)

21295. Plessey Co., Ltd.—Terminal arrangements for electrical components. 1st July, 1958. (879855.)

23121. Associated Electrical Industries, Ltd.—Electric induction apparatus. 8th July, 1958. (879940.)

26404. Philips Electrical Industries, Ltd.—Transistors. 21st August, 1957. (879649.)

30423. Philips Electrical Industries, Ltd.—Circuits for controlling the resonance frequency of an oscillatory circuit. 27th September, 1957. (879650.)

34292. National Research Development Corporation.—Electrical measuring instruments. 4th November, 1957. (879943.)

35962. C. A. Parsons & Co., Ltd.—Fuel elements for nuclear reactors. 22nd October, 1958. (879258.)

37170. Fardel, K.—Constant potential a.c. generators. 28th November, 1957. (879793.)

38663. Philips Electrical Industries, Ltd.—Television circuit arrangements. 12th December, 1957. (879795.)

1959

236. Tanaka, K.—High output lighting system for a fluorescent lamp. 2nd January, 1959. (879435.)

1752. Carr Fastener Co., Ltd.—Electrical circuit selector parts. 3rd November, 1959. (879967.)

8155. Windmill, J. H. W.—Washing machines. 18th February, 1960. (879162.)

8232. Eberle, O., and Köhler, H. (trading as Eberle & Köhler Komm Ges.).—Semiconductor devices. 10th March, 1959. (878811.)

8632. Walker & Co. (Engineers), Ltd., W. G.—Insulating supporting arrangements for electrical busbars. 8th March, 1960. (878647.)

10588. Standard Telephones & Cables, Ltd.—Electronic gas tube control circuit. 26th March, 1959. (878648.)

10950. United Kingdom Atomic Energy Authority.—Nuclear fuel materials. 25th March, 1960. (878927.)

11538. Chamberlain & Hookham, Ltd.—Indicator mechanism for use with electric relays. 28th March, 1960. (878699.)

11560. Fernseh G.m.b.H.—Circuit arrangements for clamping a signal to a reference potential. 6th April, 1959. (878649.)

11684. Standard Telephones & Cables, Ltd.—Joints and terminations for electric conductors. 1st April, 1960. (878993.)

12220. Siemens & Halske A.G.—Electronic valves of the pentode type. 10th April, 1959. (878813.)

15007. Hunting Mhoglas, Ltd.—Flexible non-metallic electric heating elements. 26th April, 1960. (Addition to 747257.) (878994.)

15210. General Electric Co., Ltd.—Nuclear power reactor arrangements. 29th April, 1960. (878701.)

15948. Mawdsley's, Ltd.—D.c. generators. 9th May, 1960. (878805.)

16304. Electrical Communication Enterprises Pty., Ltd.—Cross connecting cabinet for multiwire electrical cables. 12th May, 1959. (878864.)

21178. Sonotone Corporation.—Reinforced hollow piezo-electric ceramic transducer structures. 19th June, 1959. (878935.)

21853. Federated Foundries, Ltd., Smellie, J. H., and Ormiston, R. C.—Electrical convector heaters. 16th June, 1960. (878577.)

22394. Marconi's Wireless Telegraph Co., Ltd.—Coaxial feeder connectors. 13th November, 1959. (878865.)

25190. Associated Electrical Industries, Ltd.—Electric transformer installations. 15th July, 1960. (878583.)

25706. Associated Electrical Industries, Ltd.—Electronic amplifiers. 27th July, 1960. (879029.)

25965. Standard Telephones & Cables, Ltd.—Capacitors. 22nd July, 1960. (878867.)

26523. Simon-Carves, Ltd.—Electrostatic precipitators. 22nd July, 1960. (878869.)

26817. Naimer, H. L.—Rotary electric switch mounting. 5th August, 1959. (878618.)

26916. Philips Electrical Industries, Ltd.—Receiver circuits for selective calling. 6th August, 1959. (878685.)

28926. Foxboro Co.—Means for regulating an electric current. 24th August, 1959. (878477.)

29989. Associated Electrical Industries, Ltd.—Floor cleaning machines employing rotary brushes. 19th July, 1960. (878588.)

30480. Egyesült Izzólámpa és Villamossági R.T.—Gas filled incandescent electric lamp, more especially for projection purposes. 7th September, 1959. (879062.)

31700. R. & A. G. Crossland, Ltd.—Trunkings for continuous electric light installations. 19th July, 1960. (878589.)

33682. Associated Electrical Industries, Ltd.—Suction cleaners. 30th May, 1960. (878591.)

35119. International Resistance Co.—Electrical fuse resistors. 16th October, 1959. (878533.)

35805. Novi S.A.—Battery charging system. 22nd October, 1959. (879000.)

35938. Schostal S.A.—Electric controller switches. 23rd October, 1959. (879001.)

36325. Schmidt, P.—Discharge lamp assembly for three-phase electrical suppliers. 27th October, 1959. (878534.)

38792. Texas Instruments, Inc.—Transistor and method of making same. 16th November, 1959. (878792.)

39915. Allis-Chalmers Manufacturing Co.—Enclosed electrical switchboard structure and transformer mounting therefor. 24th November, 1959. (878960.)

41729. Waldman, H., and Gicquel, R.—Processes of manufacturing semiconductor devices. 8th December, 1959. (878544.)

42235. Eloflock Oberflächenveredlung G.m.b.H.—Electrostatic coating of filaments. 11th December, 1959. (879143.)

42377. Ranco, Inc.—Control apparatus for refrigeration. 14th December, 1959. (879079.)

42848. Blaw-Knox Co.—Means for generating electric functions. 16th December, 1959. (878596.)

43066. Marconi's Wireless Telegraph Co., Ltd.—Waveguide transformers. 5th July, 1960. (879007.)

1960

382. Hughes Aircraft Co.—Electronic storage and viewing device. 5th January, 1960. (878885.)

2120. General Electric Co.—Gas-tight sealing assemblies for dynamo-electric machines. 20th January, 1960. (879165.)

2263. Siemens-Reiniger-Werke A.G.—Electrode for generating a high frequency field. 21st January, 1960. (Addition to 830116.) (878689.)

2520. Don-Lon Electronics, Inc.—Remotely operable electromagnetic coaxial switch. 22nd January, 1960. (879080.)

4849. General Electric Co.—Nuclear reactor power monitor. 1st February, 1960. (878536.)

8018. Wengel, S. M.—Electric motor. 7th March, 1960. (878537.)

8221. General Electric Co., Ltd.—Voltage stabilising circuits employing transistors. 8th March, 1960. (879095.)

8670. Standard Telephones & Cables, Ltd. (Nippon Electric Co., Ltd.)—Solid electrolytic condenser. 11th March, 1960. (878962.)

12683. Sulzer Freres S.A.—Method of operating a rectifier to regulate the reflux ratio. 8th April, 1960. (878966.)

14174. Haldex A.B.—Electric generators of the flywheel type. 22nd April, 1960. (878539.)

14641. Becker, E. W.—Process for energy production by nuclear fusion. 26th April, 1960. (879218.)

14888. Compagnie Générale de Télégraphie sans Fil.—O-type travelling wave tubes. 28th April, 1960. (878890.)

21372. Standard Telephones & Cables, Ltd.—Method of reducing the effects of interruption in carrier circuits. 17th June, 1960. (878605.)

24309. Philips Electrical Industries, Ltd.—Two-stage amplifiers. 12th July, 1960. (878977.)

25195. Siemens-Schuckertwerke A.G.—Dry rectifier assemblies. 19th July, 1960. (878607.)

25331. Thermega, Ltd.—Electrically heated textile articles. 20th July, 1960. (Addition to 743032.) (878761.)

25568. Brown, Boveri & Cie. A.G.—Lens for fast electron beams. 22nd July, 1960. (878798.)

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 243a, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

MONDAY, 30th OCTOBER

London.—1, Birdcage Walk, Westminster, S.W.1, 6 p.m. Institution of Mechanical Engineers, Thermodynamics and Fluid Mechanics Group. Discussion on "The Extent to which Data can be made Available for Engineering Design."

MONDAY, 30th OCTOBER to FRIDAY, 3rd NOVEMBER

London.—Institute of Marine Engineers, Memorial Building, 76, Mark Lane, E.C.3. Institute of Welding. Autumn meeting. Joint symposium on "Welding in Shipbuilding."

TUESDAY, 31st OCTOBER

Cardiff.—South Wales Institute of Engineers, 7 p.m. I.E.E. Western Centre, Cardiff Graduate and Student Section. "Colour Television," by P. S. Carnet.

Leicester.—Westcotes Constitutional Club, 124, Wilberforce Road, 7.30 p.m. A.S.E.E. Leicester Branch. Films evening.

London.—Grosvenor House, 7.15 for 7.55 p.m. B.E.A.M.A. Golden Jubilee dinner.

Loughborough.—Lecture Theatre, College of Further Education, Greenclose Lane, 6.30 p.m. I.E.E. East Midland Electronics and Control Group. Chairman's address, "Trends in Automation," by Dr. D. R. Hardy.

TUESDAY, 31st OCTOBER and WEDNESDAY, 1st NOVEMBER

London.—Institute of Plastics, Conference on "Engineering with Plastics." Dinner at Connaught Rooms on 31st October.

WEDNESDAY, 1st NOVEMBER

Bristol.—University, 7 p.m. I.E.E. Western Centre, Bristol Graduate and Student Section. "Colour Television," by P. S. Carnet.

Charlton.—Johnson & Phillips, Ltd., Victoria Works, 2.30 p.m. I.E.E. London Graduate and Student Section. Visit.

Coventry.—Alfred Herbert Hall, 7 p.m. I.E.E. South Midland Centre Graduate and Student Section. "Radio Telemetry—Its Development and the Future," by R. E. Young.

Edinburgh.—V.M.C.A., 14, South St. Andrew Street, 6.15 p.m. I.E.S. Edinburgh Centre. "The Association of Light and Colour," by A. D. Charters.

Glasgow.—Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, C.2, 6 p.m. I.E.E. South West Scotland Sub-Centre. "Some Notes on the Electrical Requirements of General Cargo Docks," by E. R. Radway.

Leicester.—College of Technology, 6.30 p.m. Institution of Heating and Ventilating Engineers, East Midlands Branch. "Warm Air Curtains," by J. N. Saunders.

London.—Savoy Place, W.C.2, 6 p.m. I.E.E. and Royal Aeronautical Society London Joint Group. "Generation of Power in Satellites," by H. J. H. Sketch.

School of Hygiene and Tropical Medicine. Keppel Street, Gower Street, W.C.1, 6 p.m. British Institution of Radio Engineers, Education and Training Committee. "The Teaching of the Theory of Transistors and other Semiconductor Devices," by Prof. M. R. Gavin.

Manchester.—North Western Electricity Board Service Centre Theatre, Town Hall Extension, St. Peter's Square, 7.30 p.m. A.S.E.E. Manchester Branch. "Static Switching Control Systems," by B. A. W. Midgley.

Middlesbrough.—Cleveland Scientific and Technical Institution, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "Thermistors—their Theory, Manufacture and Application," by R. W. A. Scarf and R. A. Settrington.

Newcastle-on-Tyne.—Conservative Club, Pilgrim Street, 7 p.m. I.E.E. North Eastern Centre. "The Potentialities of Artificial Earth Satellites for Radiocommunication,"

by W. J. Bray, and "The Interdependence of Civil and Electrical Engineering on the Continent Today," by F. C. Greenfield.

Percy Building.—King's College, Queen Victoria Road, 6.15 p.m. I.E.S. Newcastle-upon-Tyne Centre. "A Symposium on Office Lighting," by J. K. Boud and E. B. Sawyer.

Portsmouth.—Royal Air Force Association Club, 7.30 p.m. A.S.E.E. Portsmouth and District Branch. Film night.

Preston.—Farmer's Arms Hotel, Market Street, 7.30 p.m. A.S.E.E. Preston Branch. "Industrial and Commercial Lighting Fittings," by A. G. Smith.

Rotherham.—Technical College, 7 p.m. I.E.E. Sheffield Sub-Centre, Graduate and Student Section. "Intrinsically Safe Apparatus," by L. Hallard and R. Ingle.

Salford.—Royal College of Advanced Technology, 7 p.m. I.E.E. North Western Centre, Graduate and Student Section. "Experimental Investigation of Space," by P. J. Bowen.

Southampton.—University, 7 p.m. I.E.E. Southern Centre. "Brushless Variable Speed Induction Motors Using Phase-Shift Control," by Prof. F. C. Williams, Dr. E. R. Laithwaite, J. F. Eastham and W. Farrer.

Southsea.—Royal Beach Hotel, 7.30 p.m. Institution of Plant Engineers, Southern Branch. "My Job," by A. G. Williams.

St. Helens.—Sutton Manor Colliery, 6 p.m. A.S.E.E. Liverpool and District Branch. Visit.

Swansea.—Demonstration Theatre, South Wales Electricity Board, Kingsway, 6 p.m. I.E.S. Swansea Group. "The New I.E.S. Code," by Dr. W. E. Harper.

Wolverhampton.—College of Technology, 7 p.m. British Institution of Radio Engineers, West Midlands Section. "Electronics in Biological Engineering," by W. J. Perkins.

Wood Green.—Civic Centre, 8 p.m. A.S.E.E. North London Branch. "Electrical Aspects of Process Control," by W. C. Hankins.

THURSDAY, 2nd NOVEMBER

Brighton.—Cricketers Hotel, Black Lion Street, 7.30 p.m. A.S.E.E. Brighton, Hove and District Branch. "Electricity Supply Regulations."

Cardiff.—Bowchier Hall, I.E.S. Cardiff Centre. "The New I.E.S. Code," by Dr. W. E. Harper.

Chelmsford.—Social Hall, Crompton Parkinson, Ltd., 7.30 p.m. Chelmsford Engineering Society. "Lighting of Niagara Falls," by T. G. Proctor and D. J. Reed.

Coventry.—Hotel Leofric, 7.30 p.m. Institution of Plant Engineers, Birmingham Branch. "Electrification of British Railways—Crewe to London."

Edgbaston.—Botanical Gardens, 7.30 p.m. I.E.S. Birmingham Centre. Ladies' night.

Glasgow.—Royal College of Science and Technology, C.I., 7.30 p.m. Institution of Mechanical Engineers, Scottish Branch. "Closed Cycle Gas Turbine Development for Low Grade Fuels," by W. Connell.

Leeds.—Chemistry Lecture Theatre, 6.30 p.m. I.E.E. North Midland Centre. Joint meeting with the Yorkshire Association of the Institution of Civil Engineers and the Yorkshire Branch of the Institution of Mechanical Engineers. "Blaenau Ffestiniog and other Medium-Head Pumped Storage Schemes in Great Britain," by H. Headland.

London.—Savoy Place, W.C.2, 5 p.m. I.E.E. corporate members. Special general meeting, 6 p.m. Ordinary meeting. "Acoustics and the Electrical Engineer," by T. Somerville.

Waterloo Station Signal Box. 7 p.m. I.E.E. London Graduate and Student Section. Visit.

Malvern.—Winter Gardens, 7 p.m. British Institution of Radio Engineers, South Midlands Section. "Transistor Portables," by R. A. Lampitt.

Manchester.—Reynolds Hall, College of

Technology, 7 p.m. British Institution of Radio Engineers, North Western Section. "V.H.F. Communication Receivers and Transmitters using Transistors," by A. J. Rees and D. C. Carey.

Nottingham.—Electricity Centre, Carrington Street, 6 p.m. I.E.S. Nottingham Centre. "Traffic Signals," by B. M. Cobbe.

FRIDAY, 3rd NOVEMBER

Bridgend.—Dunraven Arms Hotel. Institution of Plant Engineers, South Wales Branch. Dinner and dance.

Clacton-on-Sea.—Royal Hotel, Ipswich and District Electrical Association. Annual ladies' ball.

Coventry.—Hotel Leofric. Institution of Plant Engineers, Birmingham Branch. Dinner and dance.

Gillingham.—Central Hotel. Institution of Plant Engineers, Kent Branch. Dinner and dance.

Liverpool.—Industrial Development Centre, M.A.N.W.E.B., Paradise Street, 7.30 p.m. A.S.E.E. Liverpool and District Branch. "Current Practice and Recent Trends in Cable Joints and Terminations up to 11 kV," by H. Flack.

London.—Savoy Place, W.C.2, 6 p.m. I.E.E. Medical Electronics Discussion Group. Discussion on "Information Theory in Relation to Biology," to be opened by Prof. D. M. MacKay.

Connaught Rooms. Great Queen Street, W.C.2. Institution of Production Engineers and Institute of Materials Handling. Fourth Materials Handling Convention. "Profit by Handling!"

Manchester.—Engineers' Club, Albert Square, 6.30 p.m. Institution of Heating and Ventilating Engineers, Manchester and District Branch. "Warm Air Door Curtains," by J. N. Saunders.

Newcastle-upon-Tyne.—Grey Hall, King's College, 6.30 p.m. I.E.E. North Eastern Graduate and Student Section. "The Hownsgill Plate Mill—Its Construction and Operation," by M. H. Hepworth. Joint meeting with Graduate and Student Sections of Institution of Civil Engineers and Institution of Mechanical Engineers.

Nottingham.—Reform Club, 7.30 p.m. A.S.E.E. Nottingham Branch. Convivial evening.

Plymouth.—Showroom and Offices, South Western Electricity Board, St. George's Street, 2 p.m. Association of Public Lighting Engineers, South Western Section. Papers on "The New Tamar Bridge," by R. Hodges and C. G. Agg.

Wolverhampton.—Woolpack Restaurant. A.S.E.E. Wolverhampton and District Branch. Annual dinner-dance.

SATURDAY, 4th NOVEMBER

Consett.—Hownsgill Plate Mill. I.E.E. North Eastern Graduate and Student Section. Visit.

London.—Clock Tower, Houses of Parliament, 10.30 a.m. I.E.E. London Graduate and Student Section. Visit.

Carlton Rooms. Maida Vale, W.9, 7.30 p.m. I.E.E. London Graduate and Student Section and the Graduate and Student Sections of the Institutions of Mechanical and Civil Engineers. Joint dance.

Office Lighting Week

The Central England Region of the British Lighting Council is holding an Office Lighting Week from 30th October to 4th November. The programme includes an exhibition and conferences at the Friends' Institute, Moseley Road, Birmingham, 12.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Burma.—Union Purchase Board, Rangoon. 6th November. Wire and cable. (E.S.B. 32852/61.)*

Canada.—Manitoba Hydro, Winnipeg. 28th November. 230 kV switchgear. (E.S.B. 32832/61.)* 115 kV circuit-breakers. (E.S.B. 32892/61.)*

Edinburgh.—Forth Road Bridge Joint Board. 20th November. Lighting installations on northern and southern approach roads. (See Classified Advertisement Section.)

Hereford.—Corporation. 24th November. Electrical installations in 146 houses at Newton Farm site. (See Classified Advertisement Section.)

India.—India Store Department. 20th November. Transformer oil filtering sets, vacuum pumps, heating pads and oil testing transformers for the Sharavathi Valley hydroelectric project. 11th December. Electrical drying equipment. (See Classified Advertisement Section.)

Punjab State Electricity Board. 21st November. L.V. metering equipment. (E.S.B. 32259/61.)* 28th November. Air-break switches. (E.S.B. 32265/61.)* 29th November. Polyphase energy meters. (E.S.B. 32260/61.)* 11th December. 127 sets of 11 kV metering equipment. (E.S.B. 32261/61.)* 13th December. 5,145 surge divertors, 11 and 33 kV. (E.S.B. 32266/61.)* 20th December. 22 and 33 kV metering equipment. (E.S.B. 32267/61.)* 30th December. 990 single-phase time switches. (E.S.B. 32262/61.)* 11th January, 1962. Time switches. (E.S.B. 32263/61.)*

Andhra Pradesh State Electricity Board. 23rd November. 11 kV metering equipment. (E.S.B. 32255/61.)* 29th November. L.V. metering equipment. (E.S.B. 32274/61.)*

Director General of Supplies and Disposals. 28th November. Ultrasonic electric crack detectors. (E.S.B. 32272/61.)*

Southern Railway. 30th December. Equipment to control 110 and 25 kV switchgear at traction substations. (E.S.B. 32271/61.)*

Iraq.—Ministry of Municipalities. 2nd December. Transformers. (E.S.B. 32841/61.)*

Ministry of Communications. 11th November. Communications equipment. (E.S.B. 32842/61.)*

Ministry of Defence. 22nd November. Generating sets. (E.S.B. 32835/61.)*

New Zealand.—State Electricity Department. 12th December. 1,500 miles steel cored aluminium conductor. (E.S.B. 32279/61.)* 23rd January. Thirty-nine three-phase 110 kV, 3,500 or 5,000 MVA circuit-breakers. (E.S.B. 32824/61.)*

G.P.O., Wellington. 23rd November. 650 hand-lamps. (E.S.B. 32814/61.)*

Norwich.—City Council. 3rd November. Street lighting improvement schemes for the year ending March, 1963. (See Classified Advertisement Section.)

Pakistan.—Chief Controller of Stores. 13th November. 18,000 electric lamps. (E.S.B. 33124/61.)*

Water and Power Development Authority, Lahore. 17th November. Cable boxes. (E.S.B. 32588/61.)*

Saudi Arabia.—Dhahran Electric Supply Co. 15th January, 1962. Power station with

two gas turbine generating sets and transmission line with switching station for linking to the Damman supply area. (E.S.B. 32283/61.)*

South Vietnam.—Central Purchasing Authority. 8th November. Cable and accessories. (E.S.B. 32580/61.)*

South Wales.—Ministry of Transport. 21st November. Street lighting equipment for heads of the valley road, Section I, Brynmawr to Abergavenny. (See Classified Advertisement Section.)

Sunderland.—Corporation. 12th November. Electrical installation in Technical College, South Johnson Street. Borough architect, Grange House, Stockton Road.

Turkey.—Turkiye Komur Isletmeleri Kurumu. 20th November. Electric cable and accessories. (E.S.B. 32541/61/D.L.F.)*

Uganda.—Uganda Electricity Board. 24th November. Two 250 kW transportable diesel generator units. (E.S.B. 32518/61.)*

United States.—Bureau of Reclamation, Denver. 7th November. 15 MVA auto-transformer and 2.5 MVA power transformer. (E.S.B. 32300/61.)*

Washington Public Power Supply System. 10th November. Hydraulic turbine and generator for Packwood Lake hydro-electric project. (E.S.B. 32590/61.)* Switchgear and power transformer. (E.S.B. 32591/61.)*

Watford.—Corporation. 20th November. Street lighting, Colne Way-North Western Avenue. (See Classified Advertisement Section.)

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Berwick.—Houses (47) on the West Field estate; J. A. Armitage, borough surveyor.

Birkhead.—Supermarket, Village Road, Upton; Ernest S. Boyer & Partners, architects, 88, Gray's Inn Road, London, W.C.1.

Camborne.—New school, Glebe Fields, for Truro Diocesan Education Committee; Handiside & Taylor, consulting engineers, 68, Great Russell Street, London, W.C.1.

Chesterfield.—New buildings for Chesterfield School; Wilcockson & Cutts, architects, 12, Saltergate.

Croydon.—Office block, Friends Road/Edridge Road site; Impact Properties, Ltd., Napier House, 24-27, High Holborn, London, W.C.1.

Edinburgh.—Houses (183), Couper Street development area; city architect, City Chambers.

Elstree.—Public hall and swimming pool, Elstree Way, Boreham Wood (£264,000); R.D.C. surveyor, Shenley Road, Boreham Wood, Herts.

Gateshead.—Shops and supermarket, High Street, for the Charterbridge group of companies; Ardin & Brookes, architects, 6, Cavendish Place, London, W.1.

Glasgow.—Seven-storey offices, Waterloo Street/Douglas Street site (£200,000); Argyle Securities, Ltd., 24, Manor Place, Edinburgh.

Hastings.—Two 18-storey blocks of flats, Woodland Vale Road; Newday Property Co., Ltd., 13, Perrins Lane, London, N.W.3.

Haverhill.—Block of four factories; J. C. Myers, architect, 23a, High Street, Haverhill, Suffolk.

Hebburn (Co. Durham).—Bungalows (102), Ponds site; R. C. Bestow, U.D.C. surveyor.

* This information is extracted from the Board of Trade *Export Service Bulletin*. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.

Hexham.—R.C. church, Corbridge; A. Rossi, architect, 88, Medomsley Road, Consett, Co. Durham.

Huntingdon.—Kitchen (£12,850), Walnut Tree Hospital; South West General Hospitals Group, Newmarket.

Iford.—Further education wing, Fairlop School; Scott, Brownrigg & Hiscock, architects, 32, London Road, Guildford.

Inverkeithing.—Houses (58), Roman Road development; burgh surveyor, Burgh Chambers, 17, Heriot Street, Inverkeithing, Fife.

Kettering.—Extension to General Hospital (£30,000); A. J. G. Potter & Sons, Ltd., Stanwick, Wellingborough.

Leicester.—Laundry block for Royal Infirmary; Pick, Everard, Keay & Gimson, architects, 6, Millstone Lane.

Hotel.—Office block, shops, etc., Northampton Street/St. George Street site; R. Russell & Partners, architects for scheme, 28, Little Russell Street, London, W.C.1.

London.—Block of 19 flats, Elm Park Gardens, Chelsea; Anderson, Forster & Wilcox, architects, 27, Ely Place, E.C.1.

Loughborough.—First phase of new Colleges of Art and Further Education in 1962-63 (whole scheme to cost about £1,000,000); county architect, Leicester.

Manchester.—Fire station, Blackley; city architect, P.O. Box 488, Town Hall.

Revised scheme for College of Commerce, Sackville Street (£650,000); city architect.

Middlesbrough.—Houses (378), near Ormesby Road; J. A. Kenyon, borough engineer.

Minehead.—Holiday camp; Butlins, Ltd., 439, Oxford Street, London, W.1.

Newbiggin (Northumberland).—Dwellings (114), Moor housing estate; U.D.C. surveyor.

Ormskirk.—Adaptations and extensions to Ormskirk Grammar School (£143,000); Lancs. county architect, County Offices, Preston.

Penrith.—Self-service store; Middlegate; S. John Hill & Partners, architects, 2, Whitfield Street, Gloucester.

Plymouth.—Flats (60), six shops and two laundries, St. Mary Street, Stonehouse; city architect, Seymour Road.

Potters Bar.—Multi-storey offices, High Street and Mutton Lane; Abbey Properties, Ltd., 15, Thayer Street, W.1.

Reading.—Experimental X-ray Department, Battle Hospital; Calderhead & Scoble, architects, 7, Friars Stile Road, Richmond, Surrey.

St. Albans.—Church, Camp Road and Wellington Road; J. E. Holderness, architect, 82, Gurney Court Road.

Scunthorpe.—Supermarket and shops, Doncaster Road; Venture Property & Development Co., Ltd., 3, Buckingham Palace Gardens, London, S.W.1.

Seaton Valley (Northumberland).—Houses (300) to be built in 1962; U.D.C. surveyor.

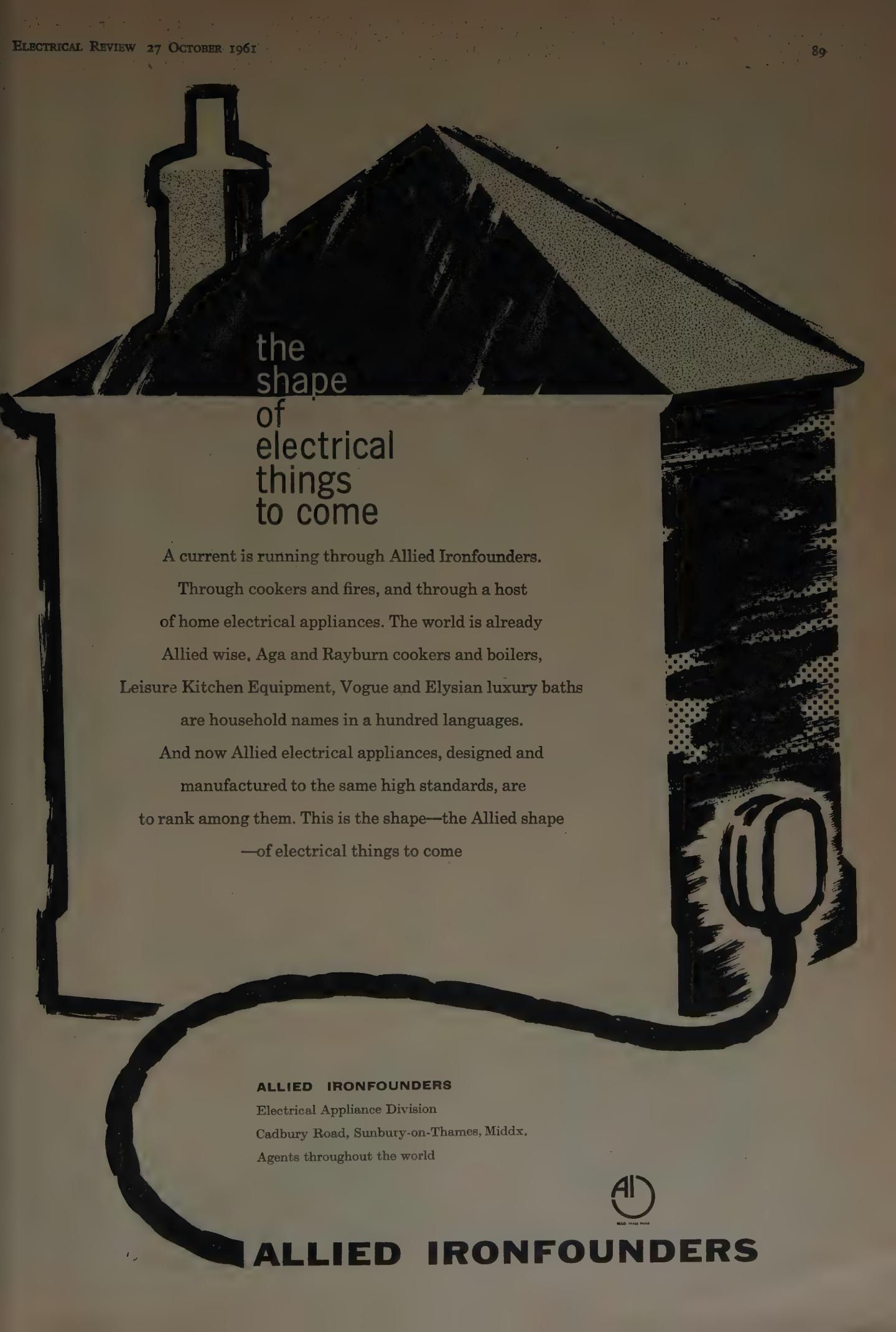
Skegness.—Factory (£40,000), industrial estate; Stiebel & Co., Ltd., Esco House, Nottingham.

Sunderland.—Three-storey offices and shops near Sunderland Railway Station for Metroviosional Properties, Ltd.; J. G. L. Poulsen, architect, 54, Albert Road, Middlesbrough.

Houses (41).—Town End Farm estate; borough architect, Grange House, Stockton Road.

Additions to Wheatsheaf transport depot (£150,000); borough architect.

Torquay.—Flats, Hesketh Road; Bell Properties (Construction), Ltd., 49, Charles Street, W.1.



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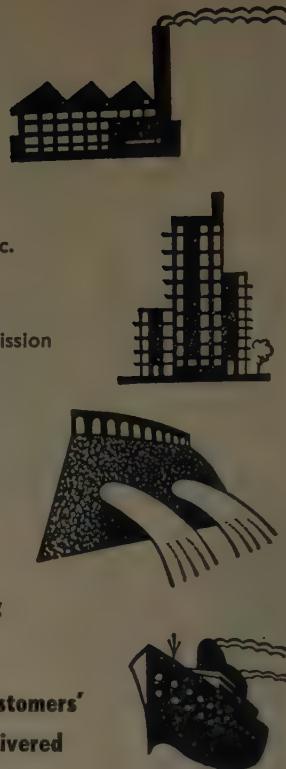
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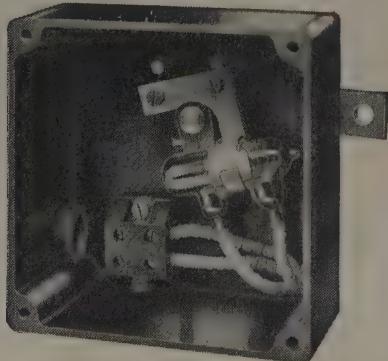
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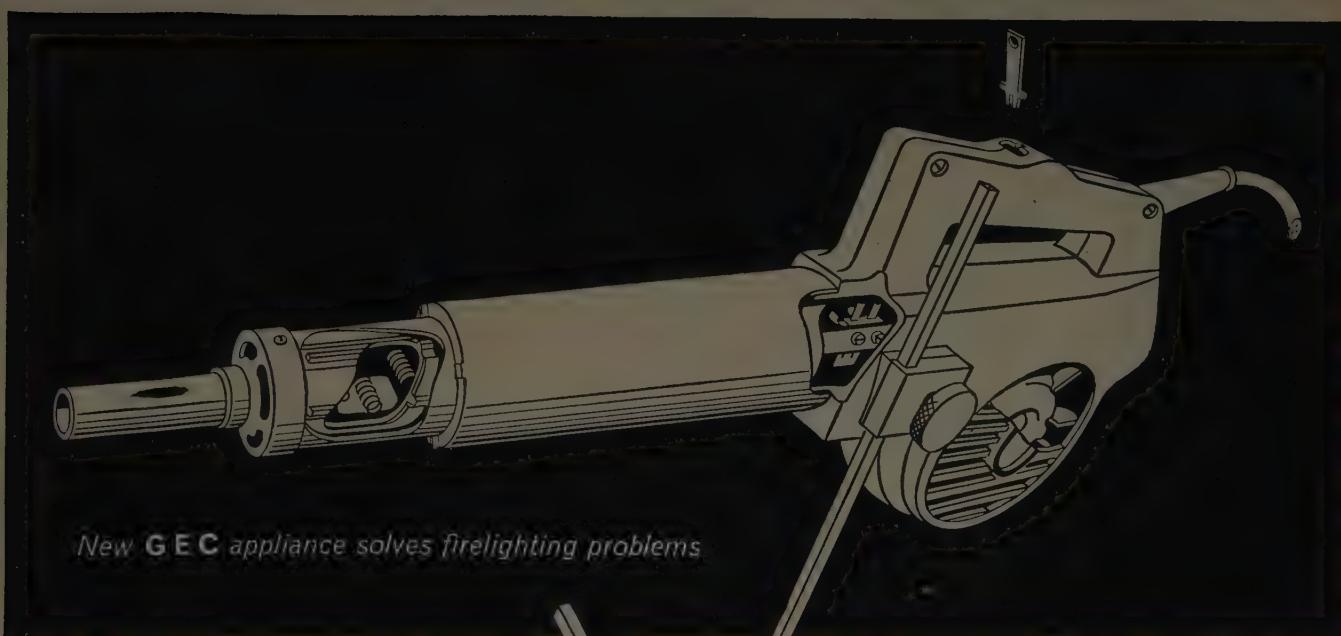
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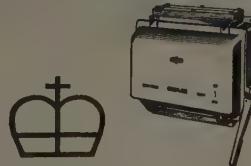
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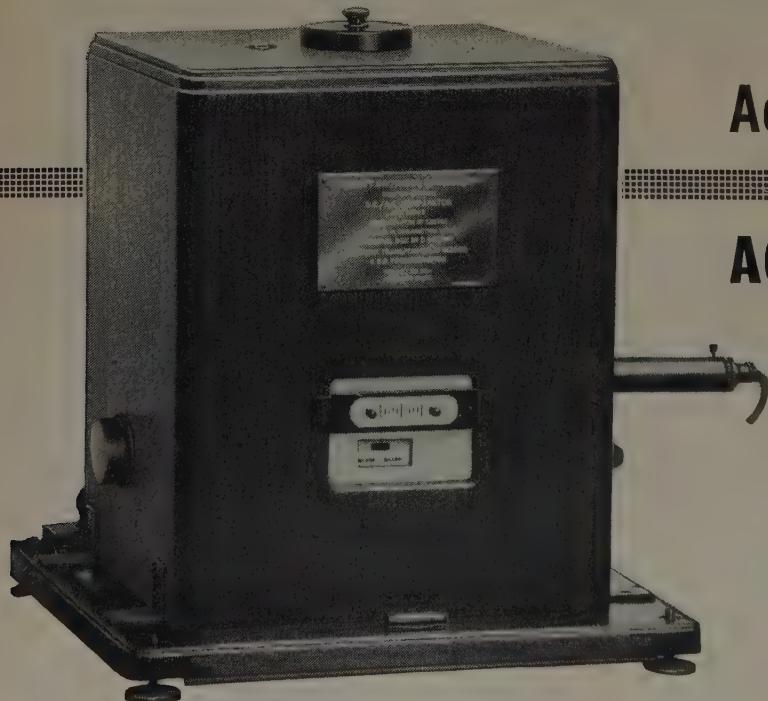
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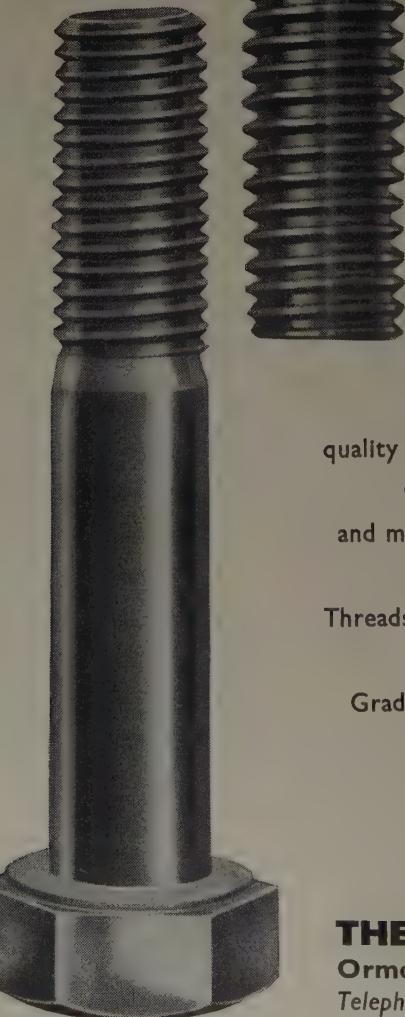
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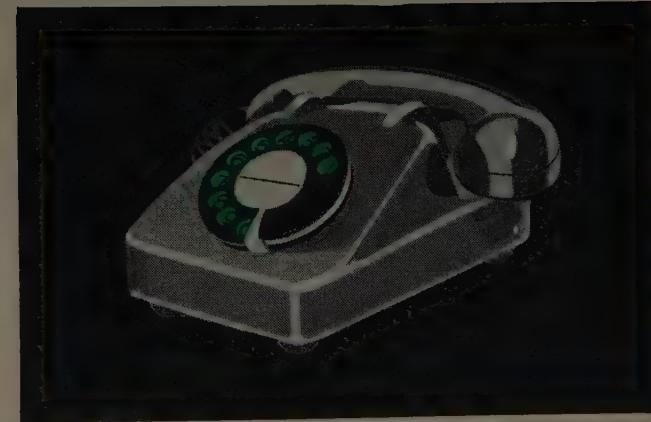
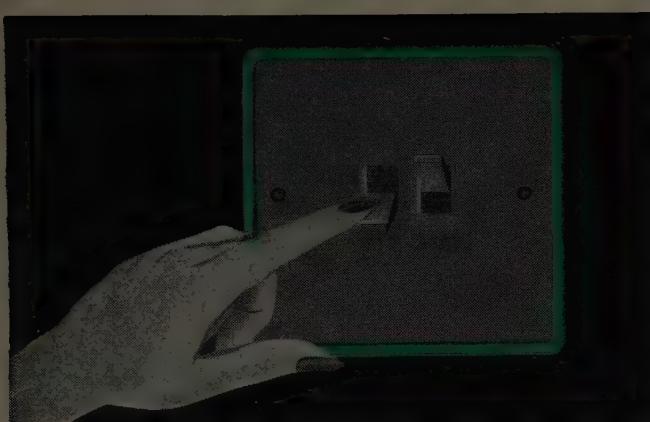


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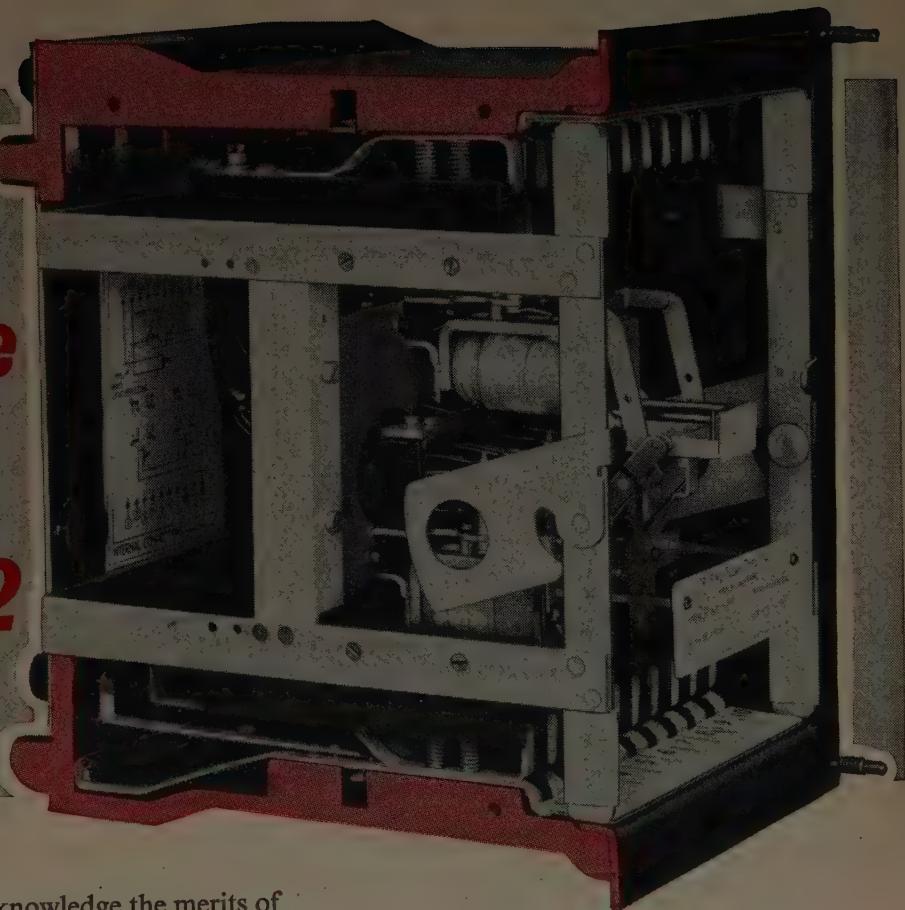
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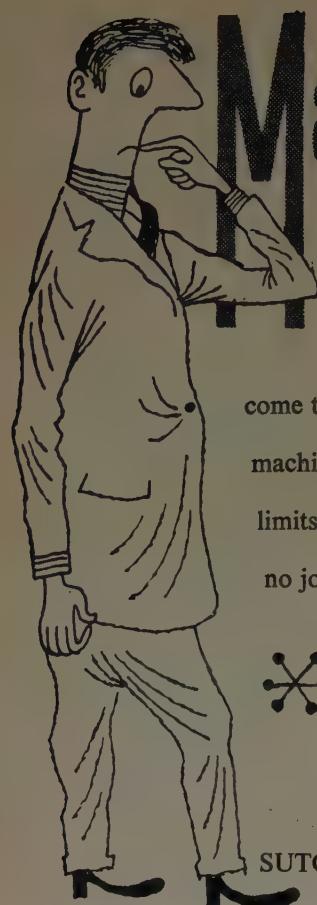
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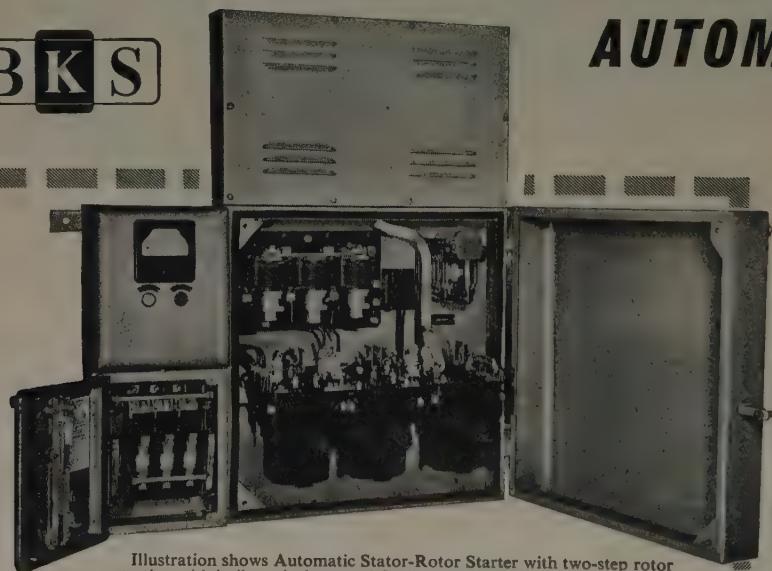


Illustration shows Automatic Stator-Rotor Starter with two-step rotor starting with built-on isolator and flush mounting ammeter with signal lights.

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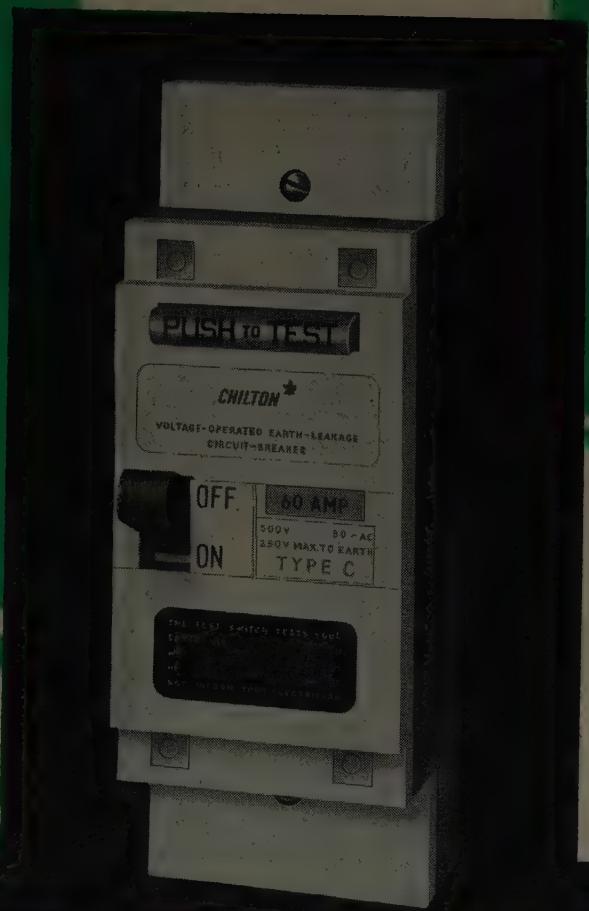
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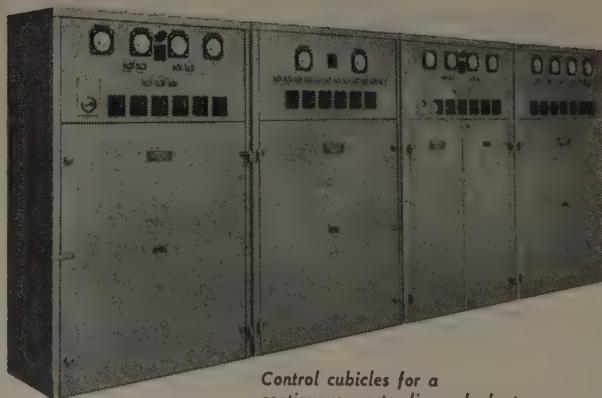
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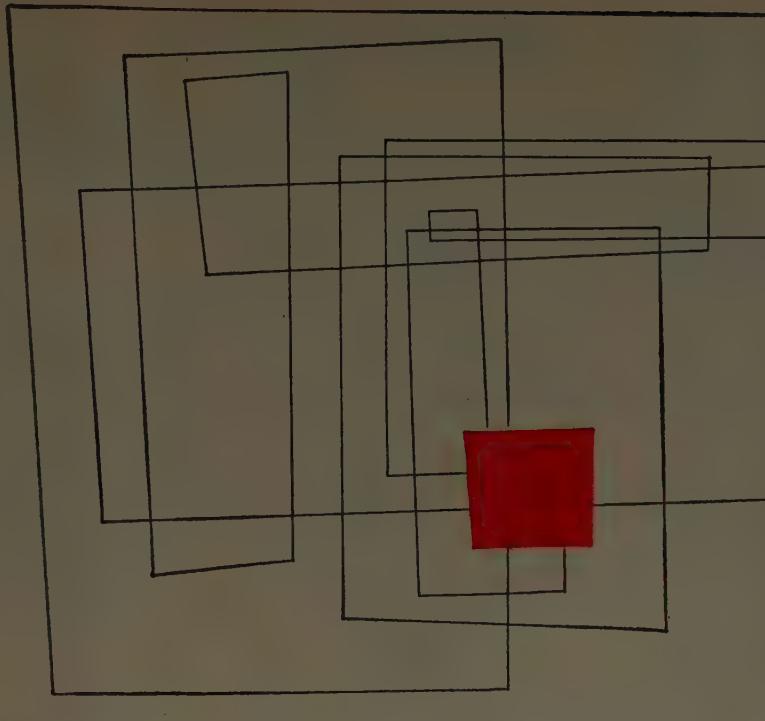
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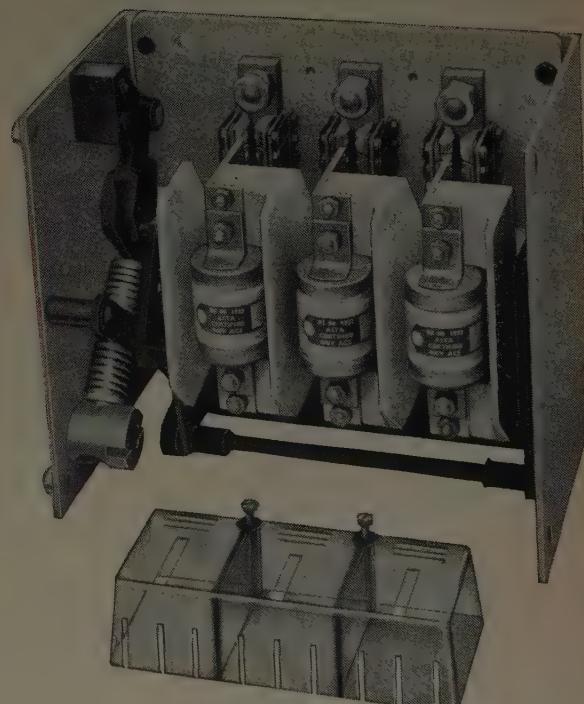
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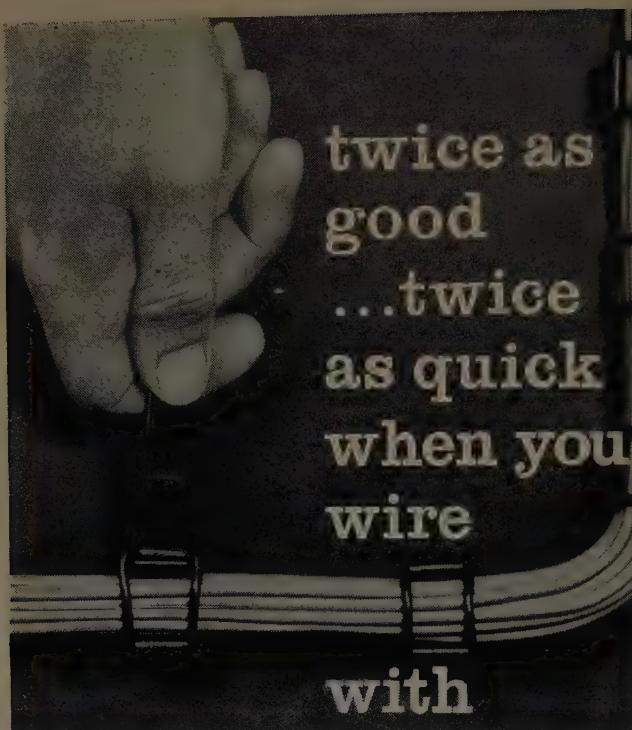
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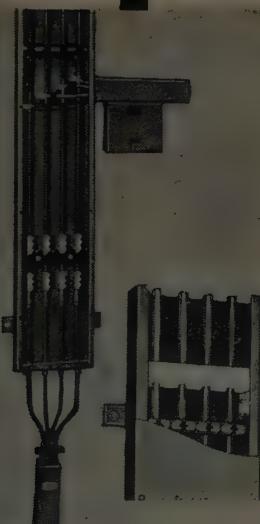
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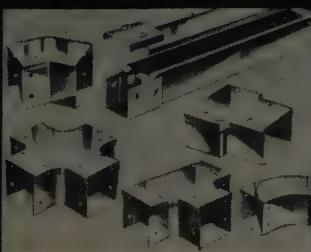
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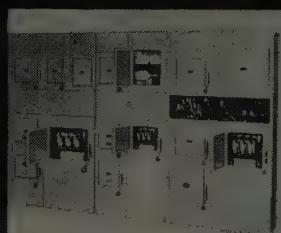
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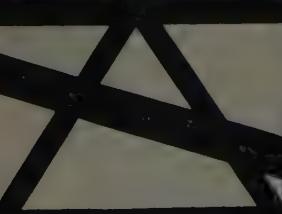
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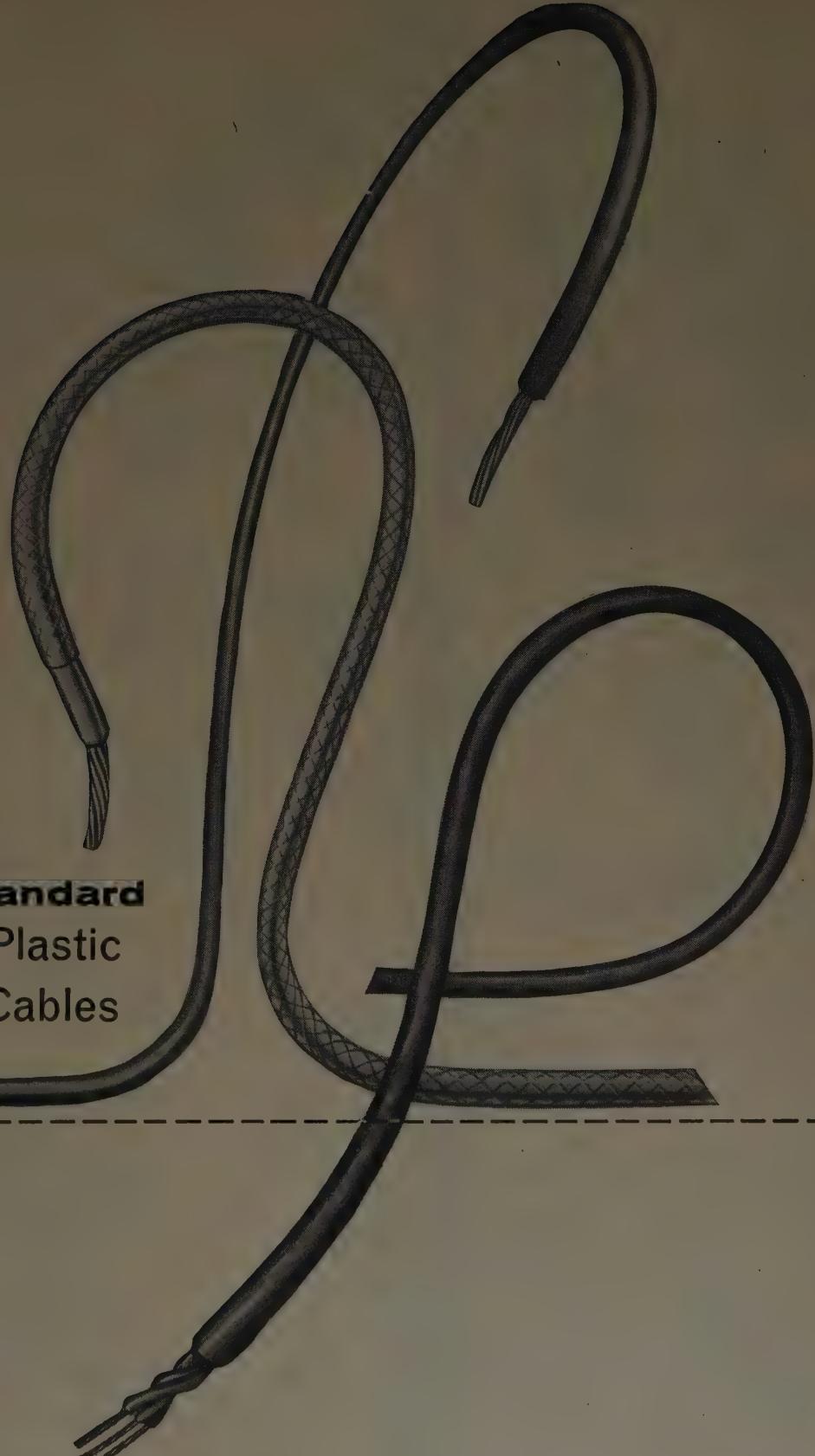
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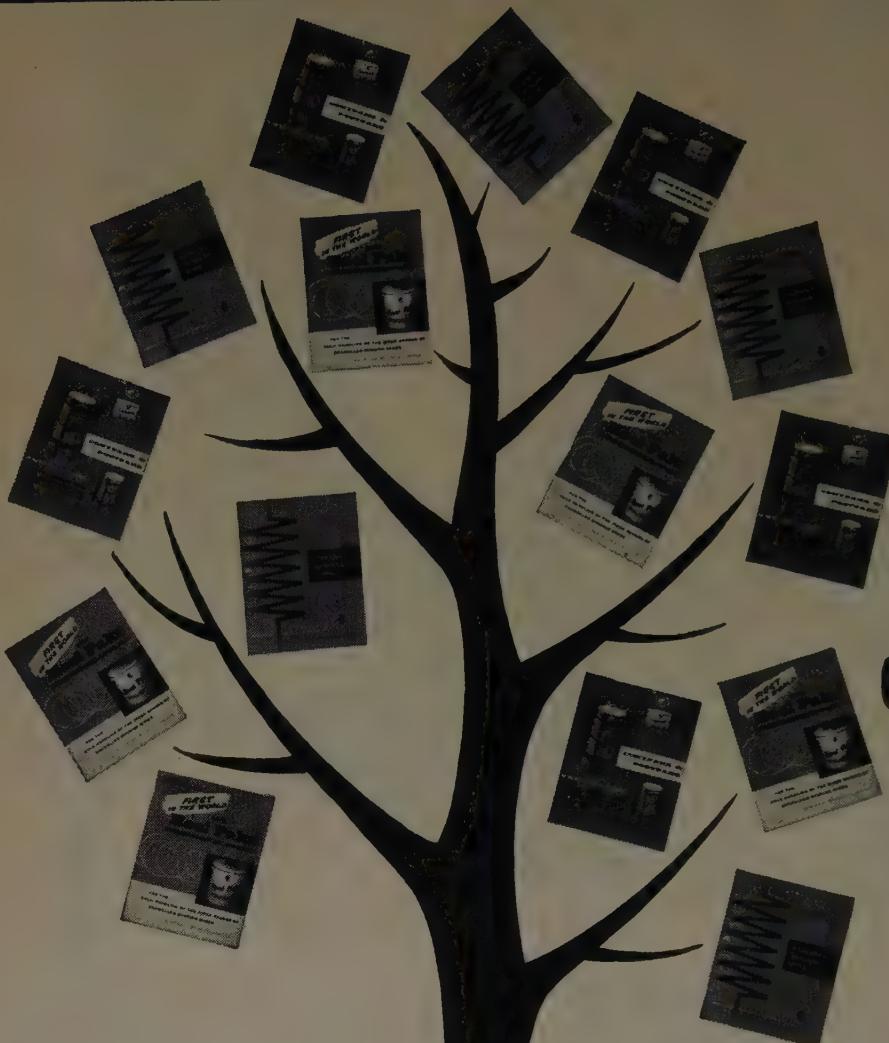
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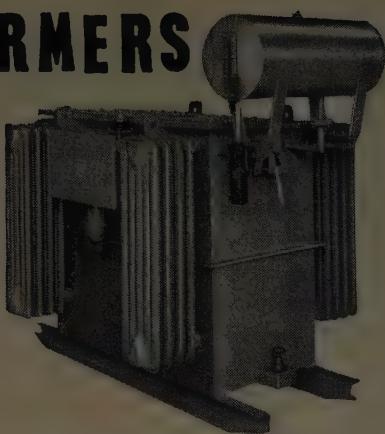
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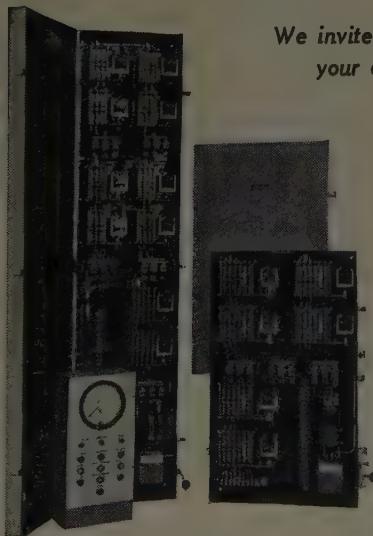
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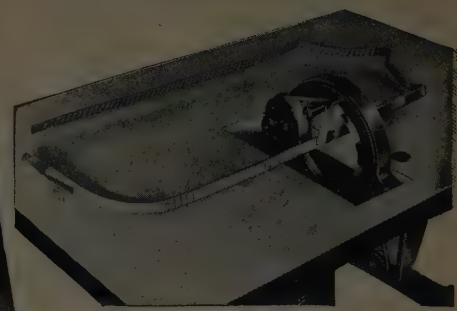


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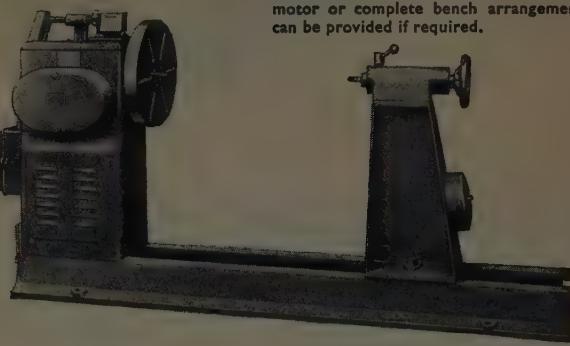
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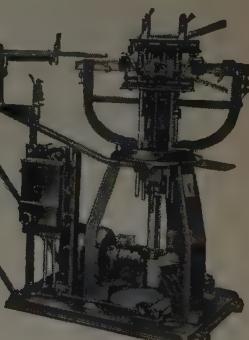
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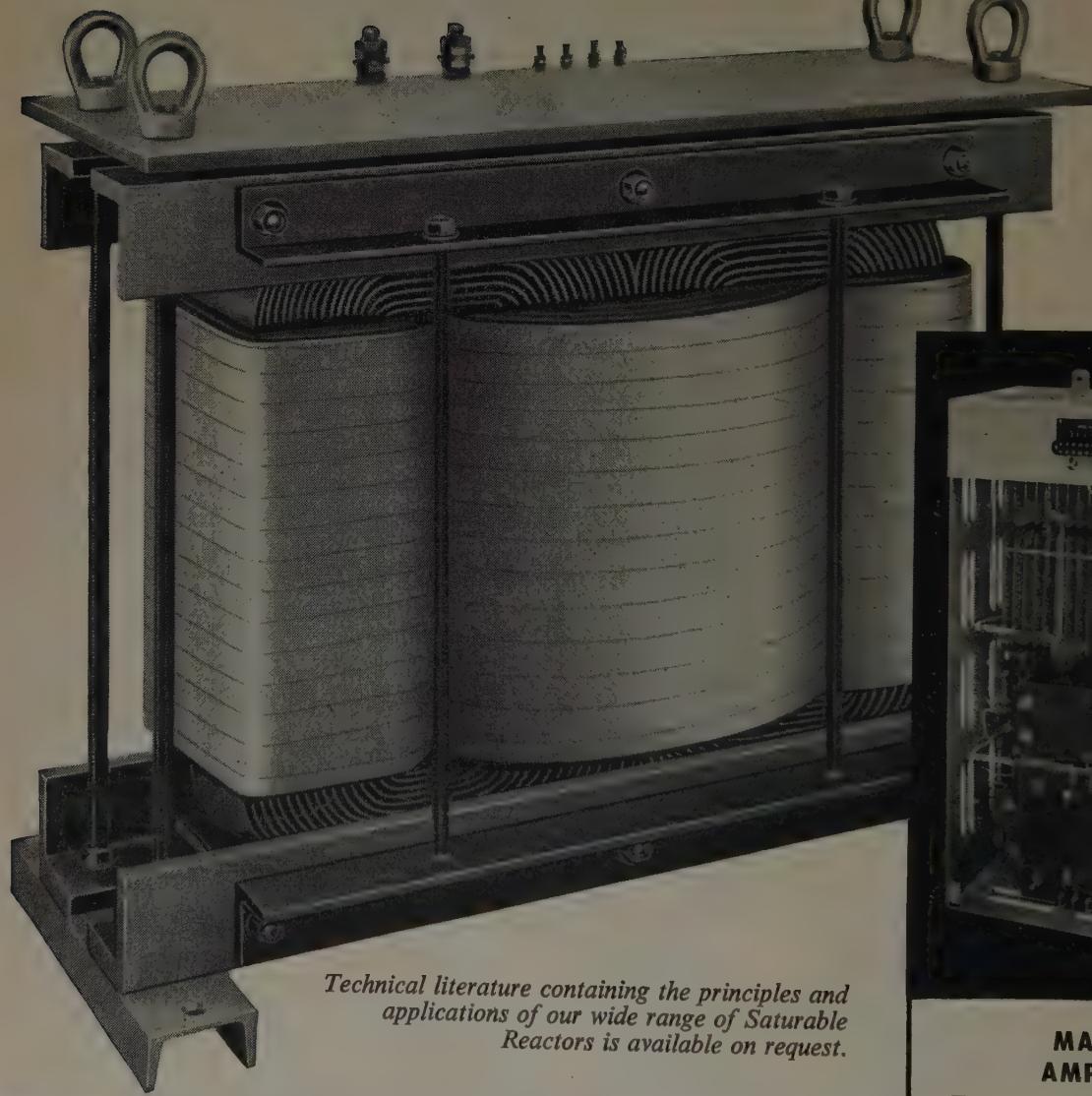


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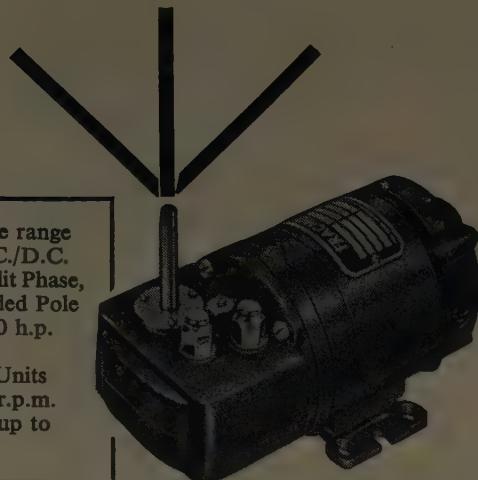
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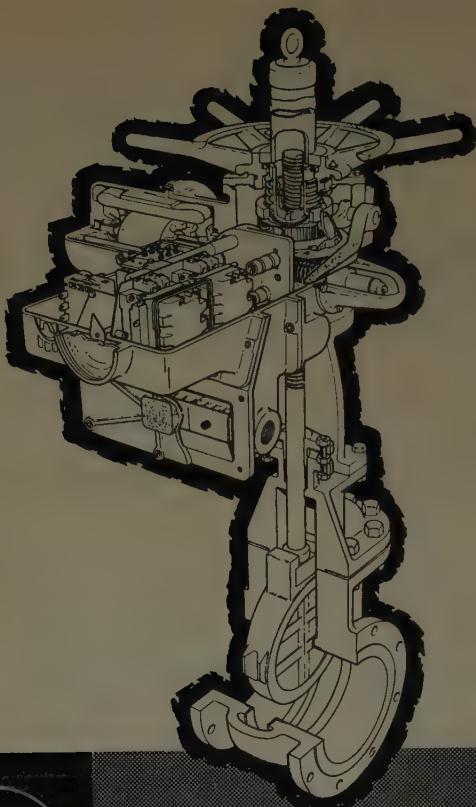
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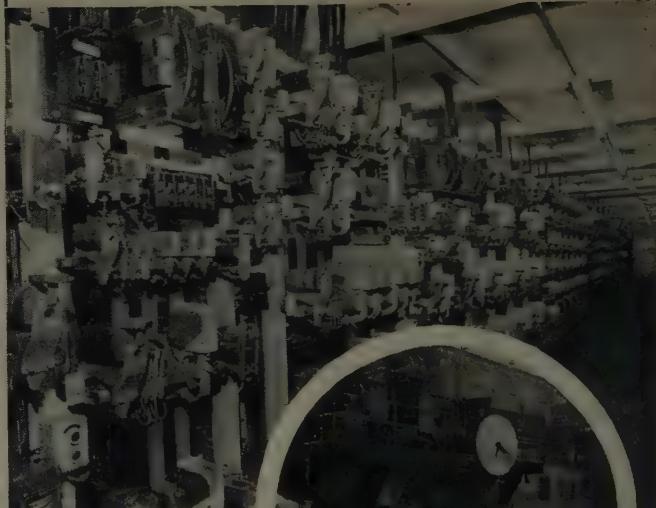
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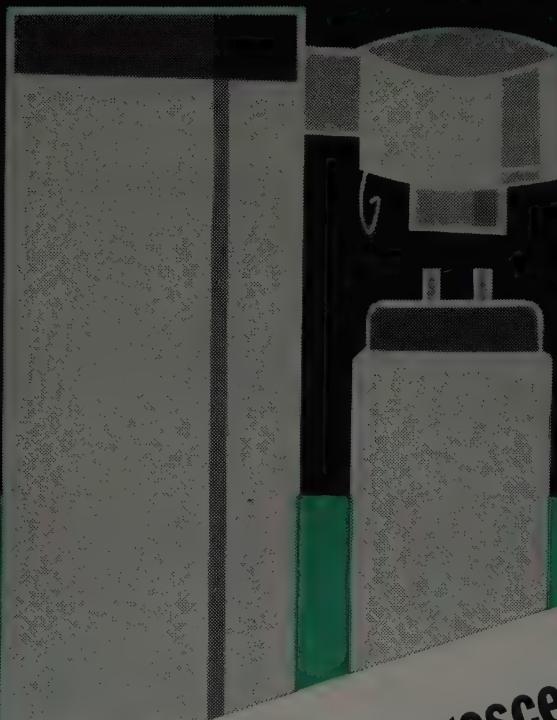
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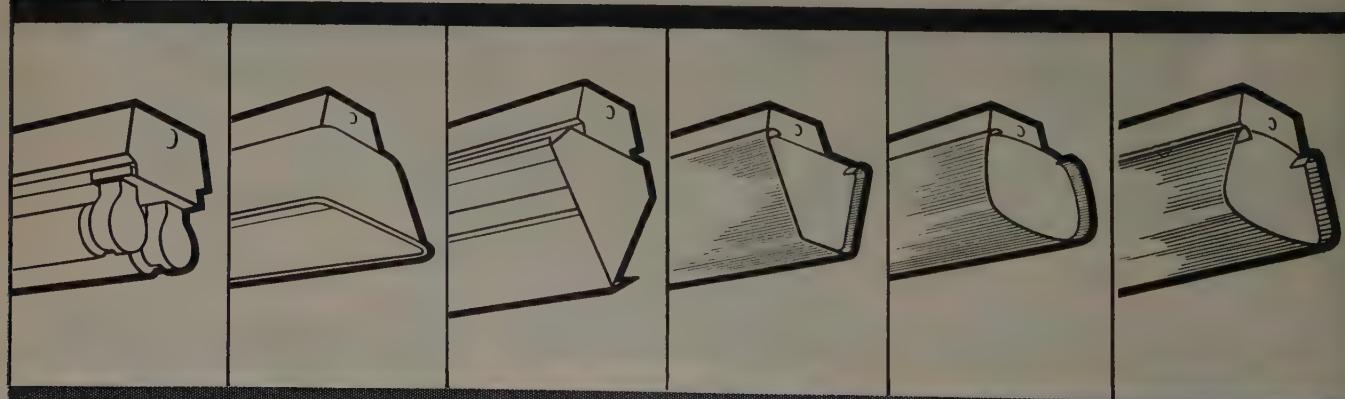
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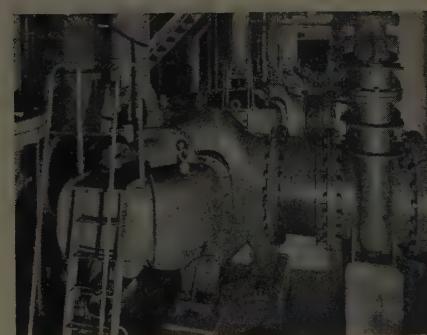


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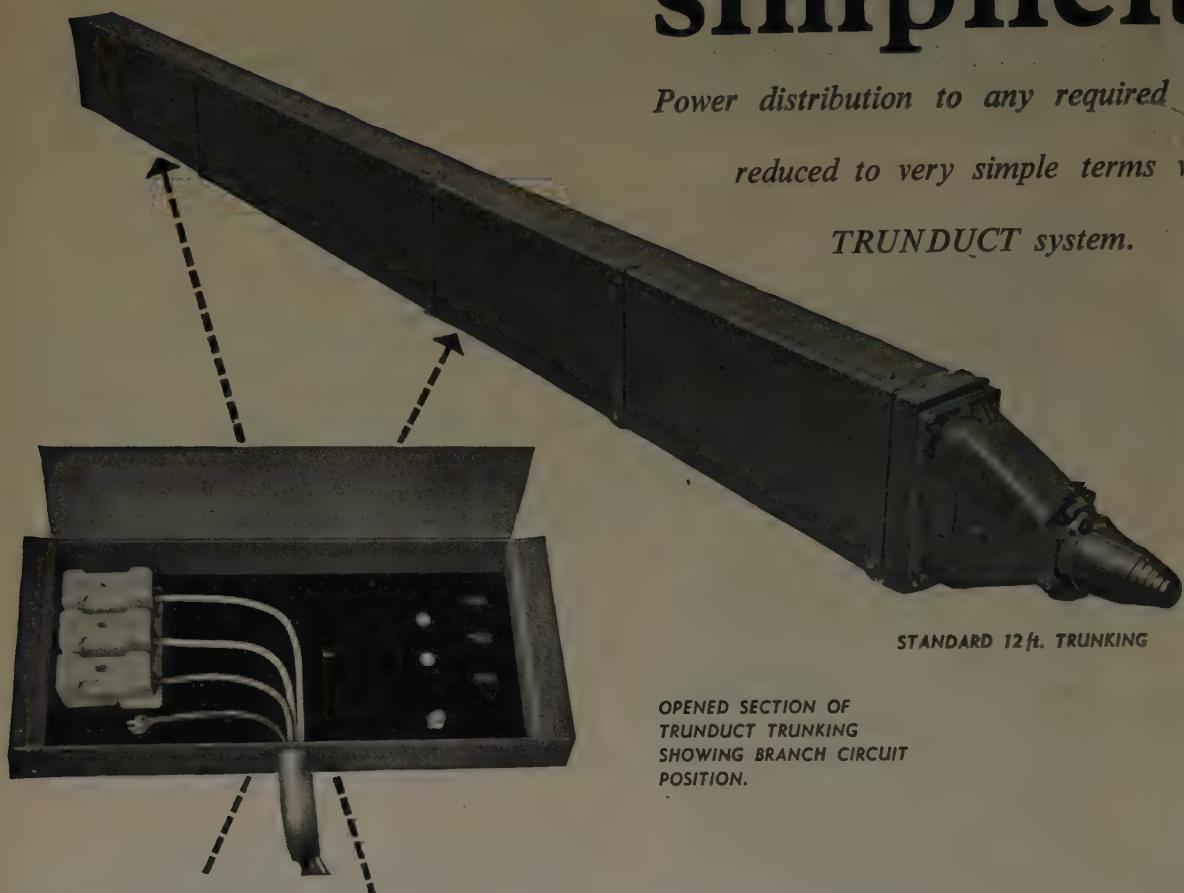
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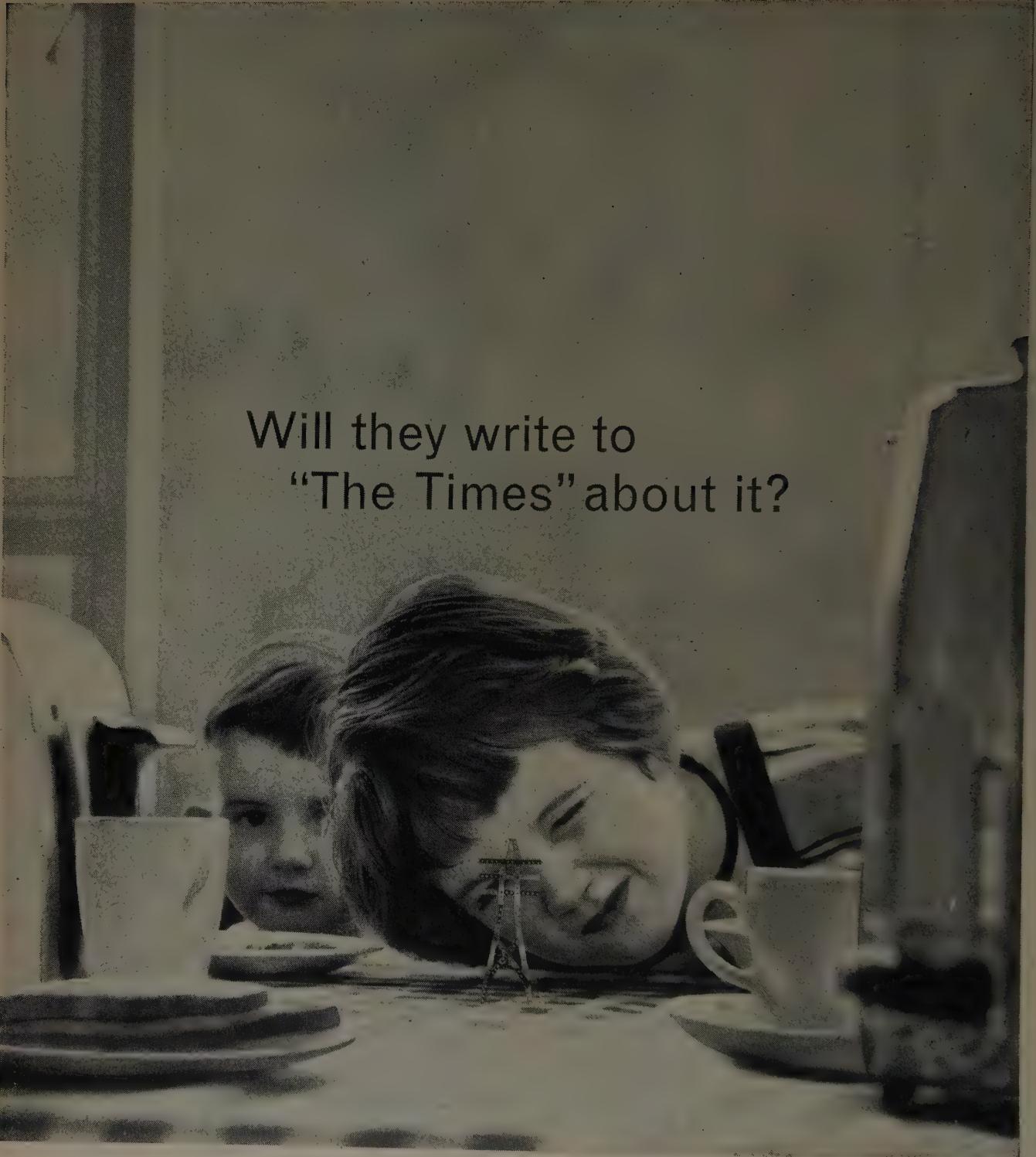
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JAMES SCOTT & CO. (ELECTRICAL ENGINEERS) LTD.
 Argyle House, Argyle Street, Newcastle-upon-Tyne 1
 Telephone: 28605

Britain's Largest Electrical Installation Organisation for all high-class Electrical Installations and Instrumentations

... for all electrical installations
F. H. WHEELER & CO. LTD.
 52 Elswick Road, Newcastle
 Telephone: Newcastle 36271

SOUTH WEST SCOTLAND

JAMES SCOTT & CO. (ELECTRICAL ENGINEERS) LTD.
 80/110 Finnieston Street 21/25 George IV Bridge
 Glasgow, C.3 Edinburgh
 Telephone: Central 3866 Telephone: Central 6424

Britain's Largest Electrical Installation Organisation for all high-class Electrical Installation and Instrumentation

(Continued on page 128)

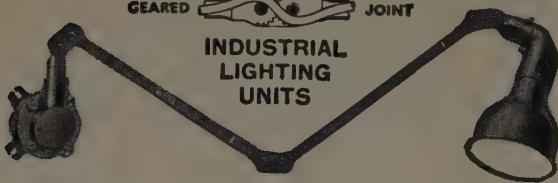
(Continued from page 127)

REPUBLIC OF IRELAND

Electrical Engineering Contractors
A. G. BRUTY LIMITED
38 Dawson Street, Dublin
Telephone: Dublin 73181

Applications for particulars of costs and standard style of advertisements in this Regional Guide should be addressed to:

THE ADVERTISEMENT DEPARTMENT
ELECTRICAL REVIEW
DORSET HOUSE, STAMFORD STREET
LONDON, S.E.1

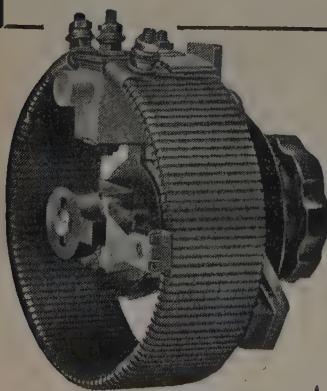
MEKELITEGEARED  JOINTINDUSTRIAL
LIGHTING
UNITS

For wall, bench or machine mounting. Catalogue sent free on request.

MEK-ELEK Engineering Ltd., MITcham
17 Western Road, MITcham, Surrey.

a range of extremely robust

ROTARY RHEOSTATS



Open or enclosed types
100 watts
150 watts
200 watts
Larger sizes quoted on request

An extremely robust rheostat with a unique metal cored former (patent appd. for)

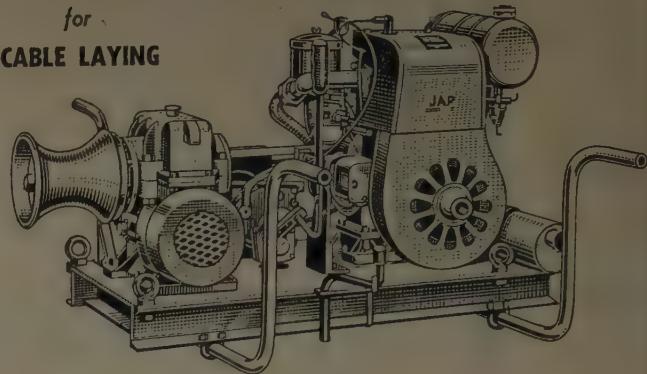
Full details from the manufacturers

The **CURTIS** Manufacturing Company Limited
26-28 PADDENSWICK ROAD
HAMMERSMITH, W.6
Telephone: RIV. 4456 and 4583

THOMPSON**1-TON PULL WINCH (Model 39)**

for

CABLE LAYING



The Model 39 is ideal for trench cable pulling work with its capacity of 1-ton pull at 45 ft per minute. The winch has been designed with 4 lifting handles for ease of man-handling on site and is powered by a 4½ h.p. J.A.P. petrol engine, as illustrated, or a Villiers diesel engine. A 3-speed forward and reverse gear box together with clutch is fitted to the winch which is priced at £220 0s. 0d. Ex Works.

Write for full details to :

THOMPSON BROS.

(ENGINEERS) LIMITED

ARCHERY WORKS • ARCHERY RD • ELTHAM • LONDON, S.E.9

Telephone: ELTham 5522/3

Lionel Robinson
& Co. Ltd.

DISTRIBUTORS
OF



102
Abbey
Street
Accrington
Accrington 32774

47
Museum
Street
Warrington
Warrington 34391/2

161-163 Eldon Street
Preston

Telephone—Preston 57975/6

4 Staple Inn
London, W.C.1
Telephone - - Holborn 6322

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 4/- per line (approx. 6 words).

DISPLAYED CLASSIFIED :—5/- per single column inch.

Where an advertisement includes a Box Number there is an additional charge of 1/-.

SERIES DISCOUNTS for consecutive insertions:—18, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED :—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Remittances payable to "ELECTRICAL REVIEW."

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual, instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

OFFICIAL NOTICES, TENDERS, ETC.

CITY OF HEREFORD

Electrical Installation to 74 Traditional Houses on Newton Farm 6 Site, Hereford

TENDERS are invited for the wiring for electricity to 74 traditional houses on Newton Farm 6 Site, Hereford.

Plan, specification and form of tender may be obtained from the City Architect, Town Hall, Hereford, upon deposit of £1 1s. (returnable following the submission of a bona fide tender and return of all documents).

Tenders should be returned in the envelope provided and endorsed "74 Houses, Newton Farm 6," to reach the undersigned not later than 12 noon on Friday, 24th November, 1961.

J. A. WESTON,
Town Hall,
Hereford.
October, 1961.

2759

BOROUGH OF WATFORD

Street Lighting

Colne Way—North Western Avenue, A.41

TENDERS are invited for the supply and erection of 52 Concrete Columns and 56 Sodium Lanterns on Colne Way—North Western Avenue, Watford.

Applications for documents, accompanied by a deposit of £2 2s., which will be returned on receipt of a bona fide tender, not subsequently withdrawn, must be made to Mr. F. C. Sage, Borough Engineer and Surveyor, Town Hall, Watford, by 3rd November, and tenders are to be submitted (in the envelope provided) to the undersigned not later than 2 p.m. on 20th November, 1961.

GORDON H. HALL,
Town Clerk.
Town Hall, Watford.

2719

CITY OF HEREFORD

Electrical Installation to 72 Traditional Houses on Newton Farm 7 Site, Hereford

TENDERS are invited for the wiring for electricity to 72 traditional houses on Newton Farm 7 Site, Hereford.

Plan, specification and form of tender may be obtained from the City Architect, Town Hall, Hereford, upon deposit of £1 1s. (returnable following the submission of a bona fide tender and return of all documents).

Tenders should be returned in the envelope provided, and endorsed "72 Houses, Newton Farm 7," to reach the undersigned not later than 12 noon on Friday, 24th November, 1961.

J. A. WESTON,
Town Hall,
Hereford.
October, 1961.

2760

FORTH ROAD BRIDGE JOINT BOARD

Street Lighting

TENDERS are invited on a fixed price basis for the supply, installation, connecting up and testing of street lighting for Pitreavie Junction, Admiralty Road Flyover and Ferry Toll Junction on the northern approach roads, and for the toll area, car park and Echline Flyover on the southern approach roads now being constructed in connection with the Forth Road Bridge.

The installations consist of 200-watt and 140-watt sodium lamps in cut-off and non-cut-off lanterns mounted at 25 ft. and 35 ft. height on steel columns, together with some special lighting and illuminated bollards.

About 74 lanterns are involved on the northern approach and 114 on the southern approach.

Contractors prepared to carry out the whole of the work should apply for the contract documents to the Consulting Engineers, Messrs. Mott Hay & Anderson, 9, Iddesleigh House, Caxton Street, London, S.W.1, to whom tenders must be returned not later than 20th November, 1961.

W. BORLAND,
Clerk to the Forth
Road Bridge Joint Board.
City Chambers,
Edinburgh.

2708

INDIA STORE DEPARTMENT

THE Office of the Chief Engineer, Hydro-Electric Construction Projects, Post Bag No. 60, Bangalore, 1, India, invites tenders for:—

Tender Enquiry No. HCP/SVHEP-10/Sept. 61. For the supply of Transformer Oil Filtering Sets, Vacuum Pumps, Heating Pads and Oil Testing Transformers for the Sharavathi Valley Hydro-Electric Project.

Specifications, drawings, etc., relative to the above tender enquiry can be obtained from the Co-ordination Branch, India Store Department, Bromyard Avenue, Acton, London, W.3, at a cost of Rs. 25/-, i.e., £1 17s. 6d. per tender enquiry. The cost of the tender documents is not refundable.

Tenders are to be returned direct to the Chief Engineer, Hydro-Electric Construction Projects, Bangalore, 1, India, and NOT to this department, and should reach him by the 20th November, 1961.

Only the manufacturers (including their constituents or associates authorised to commit them) or their accredited agents who are in a position to supply the requirements from their own or their principal's manufacture are invited to quote.

Specimen copy of the above enquiry can be seen at India Store Department, Engineering Branch, Bromyard Avenue, Acton, London, W.3, under the following reference number: S.353/61/NSC/ENG.2.

2748

Advertisements are accepted up to first post on Monday of the week of issue

If blocks, bold type or ruled borders are required then on Friday prior to week of issue

All communications to be addressed to: Classified Advertisement Department, ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

INDIA STORE DEPARTMENT

THE Director General, India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, invites tenders for the supply of:—

Electrical Drying Equipment (2 sets).

Only the manufacturers (including their constituents or associates authorised to commit them) or their accredited agents who are in a position to supply the requirements from their own or their principal's manufacture are invited to quote.

Forms of tender, which are returnable by Monday, 11th December, 1961, may be purchased from C.D.N. Section at the above address at a cost of 10s., which is not returnable. In your application for tender forms please quote reference 2357/61/ENG.1.

2724

CITY AND COUNTY OF NORWICH

Improvement of Street Lighting for the Year ending 31st March, 1962

STREET lighting schemes are to be carried out in the City on Hotblack Road, Magdalen Street (part), Chapelfield Road, St. Clements Hill and Silver Road.

Contractors who are competent to carry out supply and erection of street lighting equipment and electrical installation works, and who wish to submit tenders for the various contracts which will be required throughout the year, are invited to submit their names to the City Engineer, City Hall, Norwich, NOR 01A, within one week from the date of this advertisement.

2756

MINISTRY OF TRANSPORT

**Heads of the Valleys Road
(Section 1, Brynmawr to Abergavenny)**

TENDERS are invited for the supply of Steel Lighting Columns, Sodium Lanterns, Traffic Bollards and Subway Lighting, and for all cabling and electrical installation work.

Documents and drawings may be obtained on application to the Engineer for the Works, Rendel, Palmer & Tritton, 125, Victoria Street, London, S.W.1. Applications must be received at the above address before 12 noon on Tuesday, 21st November, 1961.

2744

SITUATIONS VACANT

(See "Replies to Box Numbers" above)

OVERHEAD TRANSMISSION LINE ENGINEERS

LARGE contracting organisation has vacancies for AGENTS, SUB-AGENTS and ENGINEERS on 275-kV and 132-kV steel tower and wood pole line contracts in Scotland.

State age and give full particulars of experience to Box No. 577, Keith & Co., 11, Castle Street, Edinburgh.

2762

Situations Vacant (continued)



**MIDLANDS
ELECTRICITY
BOARD**

APPICATIONS are invited for the following superannuable posts:—

Birmingham

**GENERAL ASSISTANT DISTRICT
ENGINEER (South-West District).**

Experience necessary in the construction, operation and maintenance of large H.V. and M.V. underground distribution systems. Technical qualifications desirable. Salary within the ranges £825/£940, £890/£1,015, £965/£1,090, £1,040/£1,165 or £1,115/£1,245 per annum (N.J.B. Grades K.14/10), according to qualifications and experience.

Apply by letter within 14 days, stating age, experience, present position and salary to Emil Braathen, Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

Central Gloucestershire

MANAGER (Area Office).

Applicants, who should hold appropriate qualifications, must have had extensive administrative experience within the electricity supply industry. Salary £3,270/£3,515 per annum (N.J.M. Class C, Grade 10).

Applications should be forwarded within 10 days to the Secretary, Midlands Electricity Board, Mucklow Hill, Halesowen, near Birmingham.

**DISTRICT SENIOR CLERK
(Severn Vale District
at Chipping Sodbury).**

Applicants should have experience of clerical and accounting procedures and the control of staff. A professional qualification would be an advantage. Duties include responsibility for consumers' records and associated matters, stores, contracting, costing and invoicing, cash collection, wages payment, meter reading and the general clerical work of the District Office. Salary £1,150/£1,240 per annum (N.J.C. Grade 6).

Applications by letter, stating age, qualifications and present position, to be forwarded within 14 days to Mr. S. Raybould, Area Manager, Midlands Electricity Board, Eastern Avenue, Gloucester.

North Staffs.

**SALES REPRESENTATIVE (Male)
(Stoke Central District).**

Duties will include advice to consumers on matters concerning supply, tariffs, apparatus sales, wiring and installation thereof. The applicant selected will also be required to assist from time to time in the District Service Centre, and this will include all day Saturday duties. Salary £600/£700 per annum (N.J.C. Grade 1). A training scheme is in operation and salary is paid during training.

Apply by letter within 10 days, stating age, qualifications, experience, present position and salary, to Mr. C. C. Pimble, Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

Wolverhampton

**THIRD ASSISTANT DISTRICT
ENGINEER (Cannock).**

Applicants should have had a sound technical training and experience in the construction, operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable. Salary £890/£1,015 per annum (N.J.B. Grade F.9).

**GENERAL ASSISTANT DISTRICT
COMMERCIAL ENGINEER (Walsall).**

Applicants should have had a sound technical training and experience in all branches of commercial work. Technical qualifications desirable. Salary within the ranges £670/£750, £715/£805, £765/£870, £825/£940 (N.J.B. Grades H.15, H.14, H.13 or H.12), according to qualifications and experience.

Apply by letter within 14 days, stating age, qualifications, experience, present position and salary, to Mr. D. Holt, Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

F. W. CATER,
Secretary.

2716

**CENTRAL ELECTRICITY BOARD
OF THE
FEDERATION OF MALAYA**

Cameron Highlands Hydro-Electric Scheme

Jor Power Station

Appointment of Mechanical Engineer

APPLICATIONS are invited for appointment A of MECHANICAL ENGINEER, Jor Hydro-Electric Station, Cameron Highlands, Malaya.

Applicants should normally be between the ages of 30 and 50. They should preferably be Corporate Members or have exemption from the Associate Membership Examination of the United Kingdom Institution of Mechanical Engineers, or possess a diploma/certificate of appropriate standard from a recognised Commonwealth mechanical engineering body.

Applicants should have had at least 10 years' maintenance experience in large power stations, at least five years of which have been spent in hydro-electric installations with attainment of responsibility.

Jor Power Station is an underground installation which will be commissioned with 2 25-MW Pelton wheel generating sets and when completed will have a total of four such sets.

The duties of the post carry responsibility for undertaking the maintenance of all mechanical plant associated with the above stations and two smaller ones in the same scheme.

The appointment is on contract for 3 years in the first place, but there is a possibility of a further contract being offered.

The salary for the contract now offered will be between £2,250 and £3,300 per annum according to qualifications, experience and marital commitments. Payment would normally be made monthly in Malaya in Malayan dollars at a fixed rate of exchange of 2s. 4d. to \$1 Malayan, but at the option of the officer an amount of up to one-third of the total salary may be paid in pounds sterling in his country of domicile.

The salaries offered are all inclusive, but the terms of service include the provision of housing at a nominal rent, free medical attention, a motor car allowance where the work necessitates the use of a vehicle, and terminal leave on full pay at the end of the contract.

First class passages to Malaya and return to his country of domicile will be provided for the officer, his wife and children up to the age of 16 years, subject to a maximum of 3 children.

If a married man leaves his family in his country of domicile, free passages for a family reunion in Malaya during the contract will be provided on request, or alternatively the officer may elect to go on annual leave to his country of domicile.

Apply to CROWN AGENTS, 4, Millbank, London, S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience, and quoting reference M2A/51455/EF.

SOUTHERN ELECTRICITY BOARD

Quantity Surveyor

Sub-Area Engineering Department (Civil Engineering Section) of No. 1 (Southwell) Sub-Area, located at Waterloo Road, Uxbridge, Middlesex. Salary N.J.B. Class M, Grade 10 (£1,325-£1,460 per annum, inclusive of London allowance). N.J.B. conditions of service.

Candidates, who should be members of the Chartered Surveyors' Institution or have equivalent qualifications, must be fully experienced in the writing of specifications, the working up and preparation of bills of quantities, be capable of settling contractors' accounts and preparing preliminary estimates for projected schemes.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him, quoting Z.1421, not later than 6th November, 1961.

**Assistant Engineer
(Maintenance and Operation)**

Melksham District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class G, Grade 9 (£965-£1,090 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.1374, not later than 6th November, 1961.

Assistant Engineer (Planning)

Melksham District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class G, Grade 9 (£965-£1,090 per annum). N.J.B. conditions of service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.1424, not later than 6th November, 1961.

Assistant Engineer (Planning)

Aldershot District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class H, Grade 10 (£965-£1,090 per annum). N.J.B. conditions of service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1425, not later than 6th November, 1961.

Senior Showroom Assistant

Bournemouth District of No. 4 (Bournemouth) Sub-Area. Salary N.J.C. Grade 3 (£780 x £25 to £880 per annum). N.J.C. conditions of service.

Applicants should have experience in all showroom duties and a sound knowledge of domestic apparatus, sales procedure, application of tariffs and consumer service. Candidates should be capable of controlling staff.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him, quoting Z.1402, not later than 6th November, 1961.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

2728

2753

ENGLISH ELECTRIC

METER RELAY and INSTRUMENT DIVISION

STAFFORD

Sales and Contracts Manager
required to lead the expansion of a product group covering electricity meters and industrial control devices.

Practising Senior Protection Engineers for Technical Presentation. Appointments in this category would be made subsequent to a familiarisation period within the division.

Engineers for Sales Promotion, Technical Writing and Sales and Contracts Work. These

vacancies offer opportunities for later transfer to Branch Offices both home and overseas.

For the more senior appointments, for which excellent salaries will be paid, a degree or corporate membership of the I.E.E. or H.N.C. is essential. Vacancies do, however, exist for more junior engineers of O.N.C. level minimum.

Write giving full particulars to Group Personnel Services, English Electric House, Strand, London, W.C.2, quoting reference number ERI 297S.

MECHANICAL AND ELECTRICAL ENGINEERS

Opportunities Overseas

AIR MINISTRY WORKS DEPARTMENT invites applications from Assistant Mechanical and Electrical Engineers for appointments initially in overseas areas on tours of 2 or 3 years' duration according to location. Completion of tour is followed by duties in U.K. with every opportunity for further tours overseas.

SALARY overseas includes **FOREIGN SERVICE ALLOWANCE** which varies according to location and whether single or married. For example, total emoluments in Cyprus at age 25 range at present from £1,316 to £1,766 (single) and from £1,676 to £2,301 (married). Annual increments to age 38 with a special increase of £95 p.a. for fully qualified men after 2 years' service.

DUTIES comprise design, construction and maintenance of installations in workshops and on airfields, radar stations and maintenance units, etc.

QUALS. At least the qualifying examination for Corporate Membership (or exemption) of the Institution of Electrical Engineers or the Institution of Mechanical Engineers (with appreciable electrical engineering experience) and not less than 2 years' professional experience.

CONDITIONS. Expatriation and kit allowances (£85 to £140 approx.). Free passage overseas for self and later for family when accommodation arranged. Free medical and child educational arrangements. 5-day week with paid annual leave initially 4 weeks and 2 days. Paid sick leave within certain limits.

PROSPECTS. Appointments are non-pensionable but retirement/resignation gratuity payable after 5 years' or more service. Excellent opportunities of obtaining permanent pensionable post (with all service counting) and of advancement to posts in the higher grades, which number 180 approx. Higher grade salaries vary between £1,456 and £3,715 p.a. and vacancies are, as a rule, filled by promotion of existing staff.

Applicants, who must be natural-born British subjects under 35 years of age, should write to Air Ministry Works Department (W.G.D.), Lacon House, Theobalds Road, London, W.C.1. Selection will be by interview in London and certain expenses will be reimbursed.

MINISTRY OF AVIATION

requires ELECTRICAL ENGINEERS (Assistant Signals Officers) for aviation telecommunications and electronic navigational aids. Min. age 23; 1st or 2nd Class Degree in Physics or Engineering, or A.M.I.E.E. or A.F.R.A.E.S. (candidates with Parts I, II & III of A.M.I.E.E. or Parts I & II of A.F.R.A.E.S. or equiv., or of very high professional attainment without those qualifications considered).

Salary £835 (age 23) to £1,318 (age 34), max. £1,490. Slightly lower outside Inner London. Prospects.

Forms from Ministry of Labour, Technical and Scientific Register (K), 28, King Street, London, S.W.1, quoting D.411/1A.

249

THE BRITISH ELECTRICAL & ALLIED MANUFACTURERS' ASSOCIATION

APPICATIONS from men aged not more than 30 are invited for the post of ASSISTANT in a department at Ascot largely concerned with heavy rotating plant. The main requirements are a good education, an ability to write clearly, intelligence and an agreeable manner.

The successful candidate would be expected, after an initial familiarisation with the background of the department's work, to attend committee meetings, record proceedings and work on the documents produced.

A technical qualification is not essential, but a background knowledge of the heavy side of the electrical industry could be an advantage. Sufficient interest in this field is essential to enable the holder of the post to handle technical terms with understanding.

A salary will be paid commensurate with qualifications and experience.

The post is permanent and pensionable.

Applications should be addressed to the Establishments Officer, BEAMA, 36, Kingsway, London, W.C.2.

2695

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPICATIONS are invited for the following superannuable N.J.B. Schedule A appointments:-

ASSISTANT SHIFT CHARGE ENGINEER, USKMOUHT "B" POWER STATION, WEST NASH, Nr. NEWPORT, MON. (Vacancy No. 281/ER/61).

Salary Class K, Grade 8, Scale 11, £1,275-£1,410 per annum.

ASSISTANT SHIFT CHARGE ENGINEER, USKMOUHT "A" POWER STATION, WEST NASH, Nr. NEWPORT, MON. (Vacancy No. 282/ER/61).

Salary Class K, Grade 8, Scale 11, £1,275-£1,410 per annum.

STATION SHIFT CONTROL ENGINEER, UPPER BOAT POWER STATION, Nr. PONTYPRIDD, GLAM. (Vacancy No. 283/ER/61).

Salary Class H, Grade 10, Scale 7, £965-£1,090 per annum.

Applicants for the above posts should possess H.N.C. or equivalent qualifications and have had operating experience in a modern power station.

10% shift allowance applies in each case.

ASSISTANT MAINTENANCE ENGINEER (Mechanical), USKMOUHT "A" POWER STATION, WEST NASH, Nr. NEWPORT, MON. (Vacancy No. 284/ER/61).

Salary Class K, Grade 8, Scale 11, £1,275-£1,410 per annum.

Applicants should possess H.N.C. or equivalent qualifications and have had experience of power station mechanical maintenance, including turbines, boilers and associated plant.

SECOND ASSISTANT ENGINEER (Operational Research Section), GENERATION DEPARTMENT at DIVISIONAL HEADQUARTERS (Vacancy No. 285/ER/61).

Salary Class K, Grade 5, Scale 14, £1,415 to £1,720 per annum.

Applicants should hold a recognised qualification in engineering or science and be able to apply research techniques to problems involving the efficient utilisation of resources in the general field of power station operation and maintenance.

The person appointed will be in charge of a small team and will be expected to direct a complete project. Clerical and statistical services are available in support.

Previous experience in operational research would be an advantage. Suitable applicants from other fields will be considered.

Special application forms obtainable from Divisional Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 9th November, 1961.

2707

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 1 Sub-Area

FITTERS (Electrical) required in the Liverpool North, South and Central Districts. Rate of pay 66.75d. per hour (42-hour 5-day week). N.J.C. conditions. Pension scheme.

Applicants should be experienced in the erection of 33-kV and 11-kV switchgear, and also have a knowledge of general substation construction work.

Applications in writing should be forwarded to the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3. Closing date 3rd November, 1961.

2712

Situations Vacant (continued)

RESIDENT ENGINEER
 FOR CYPRUS

APPICATIONS are invited for the appointment on agreement of a RESIDENT ENGINEER to supervise an extension to Dekelia Power Station in Cyprus, comprising the addition of one 14,000-kW steam turbo-alternator set, one 90,000-lb./hour oil-fired boiler and associated auxiliary equipment.

Applicants must be Corporate Members of either the Institution of Mechanical Engineers or the Institution of Electrical Engineers, and should have had previous experience of power station construction including civil, mechanical and electrical work.

The salary of the successful applicant will depend on qualifications and experience, subject to a maximum of £2,500 per annum. In addition, he will be provided with free accommodation and hard furnishing. He will also be eligible on commencement and termination of his engagement for free passages for himself and his wife and children to a maximum of three full passages.

The period of the engagement will be twelve to eighteen months. Leave on full pay will be granted on satisfactory termination of engagement at the proportionate rate of 2½ days per month of service.

The successful applicant will be required to take up his duties in the early part of 1962 and will be in the employment of:

PREECE, CARDEW & RIDER
 Consulting Engineers
 8, 10 & 12, Queen Anne's Gate
 Westminster, London, S.W.1

to whom applications, giving full details of age, qualifications and experience, should be submitted within 14 days of the publication of this advertisement.

2729

**CENTRAL ELECTRICITY BOARD
 OF THE
 FEDERATION OF MALAYA**
Cameron Highlands Hydro-Electric Scheme
Jor Power Station
Appointment of Station Superintendent

APPICATIONS are invited for the appointment of STATION SUPERINTENDENT, Jor Hydro-Electric Station, Cameron Highlands, Malaya.

Applicants should normally be between the ages of 38 and 50, but applications will be considered from persons over the age of 50.

They should preferably be Corporate Members of the United Kingdom Institution of Mechanical Engineers or Institution of Electrical Engineers, or possess a recognised engineering degree/diploma of a Commonwealth university or educational establishment.

Applicants should have had at least 15 years' experience in major power stations, ten of which have been spent in hydro-electric installations, with at least 5 years in a position of superior responsibility.

Jor Power Station is an underground installation which will be commissioned with 2 25-MW Pelton wheel generating sets and when completed will have a total of four such sets. The outgoing transmission circuits will be 132 kV.

The duties of the post carry responsibility for operation and maintenance of all mechanical and electrical plant, upkeep of all building and civil engineering installations, staff and financial

matters in Jor Power Station and two smaller ones in the same scheme.

The appointment is on contract for approximately three years.

This is a Superscale post and the salary will be as follows, depending upon marital commitments:

Bachelor	£3,200 p.a.
Married man	£3,550 p.a.
Married man with one or more children	£3,750 p.a.

Payment of salary would normally be made in Malaya in Malayan dollars at a fixed rate of exchange of 2s. 4d. to \$1 Malayan, but at the option of the officer an amount of up to one-third of the total salary may be paid in sterling to the officer's account in his country of domicile.

The salaries offered are all inclusive, but the terms of service include the provision of accommodation at a nominal rent, free medical attention, a motor car allowance where the work necessitates the use of a vehicle, and terminal leave on full pay at the end of the contract.

First class passages to Malaya and return to the country of domicile will be provided for the officer, his wife and children up to the age of 16 years, subject to a maximum of 3 children.

If a married man leaves his family in his country of domicile, free passages for a family reunion in Malaya during the contract will be provided on request, or alternatively the officer may elect to go on annual leave to his country of domicile.

Apply to CROWN AGENTS, 4, Millbank, London, S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience, and quoting reference M2A/51454/EF.

2727

UNIVERSITY OF BRISTOL
Electrical Engineering Department

APPICATIONS are invited for a LECTURESHIP (Grade II) in ELECTRICAL ENGINEERING. Candidates must have good academic qualifications in electrical engineering, physics or mathematics; and some training and/or experience in the applications of electricity. An interest in electrical power and machinery, in which the facilities for research are exceptionally good, is desirable.

The post will be vacant on 1st April, 1962, but a later (or earlier) starting date might be arranged. Applicants should give full particulars of age and career to date, and the names of at least two persons to whom reference may be made. Salary according to age and experience, on the scale £1,050 to £1,850, with family allowance (where appropriate) and superannuation on F.S.S.U. terms.

Applications (or provisional enquiries from interested persons) should be submitted as soon as possible to the undersigned, from whom further particulars may be obtained.

H. C. BUTTERFIELD,
 Registrar and Secretary.

2725

**A NATIONAL INDUSTRIAL
 ELECTRICAL WHOLESALER**

with an expanding organisation is looking for a number of SENIOR SALESMEN with a dynamic approach to selling, and especially men who are seeking advancement to management.

Excellent prospects are offered to the right men in London and the Midlands.

Apply giving full details of career to the Sales Director.—Box 2736.

**PIRELLI-GENERAL
 CABLE WORKS LTD.**

wish to make the following appointments in their

ENGINEERING DEPARTMENT
(1) ENGINEER
**FOR HIGH-FREQUENCY
 MEASUREMENT**

To undertake special measurements on telephone and high-frequency cables associated with the company's development work. Also to work on pre-acceptance transmission measurements on certain audio, carrier and co-axial cable routes installed by the company.

(2) ENGINEER
FOR TELEPHONE AND HIGH-FREQUENCY CABLE DESIGN

To undertake the design of telephone and high-frequency cables for specialised requirements. The work will cover all aspects of the construction of these types of cable from the original specification to the final electrical characteristics. Some knowledge of telecommunication system design would be an advantage.

Both these posts are senior status and require a minimum qualification of H.N.C. or equivalent in Telecommunication Engineering. The company will consider the training of applicants who, although not specialists in this field, possess energy and ability. Preferred age range 21/30.

Letters of application giving full details of age, education, training and qualifications should be addressed to the

Personnel Manager
**PIRELLI-GENERAL CABLE
 WORKS LTD.**
 Southampton

2758

SOUTH EASTERN ELECTRICITY BOARD

FITTER (Electrical), East Sussex and South West Kent Sub-Area. Wages 5s. 6½d. per hour for 42-hour 5-day week under N.J.I.C. Agreement. The successful applicant will be based on the workshop at Eastbourne, but the duties will chiefly comprise erection and maintenance of switchgear and transformers in major substations in all parts of the Sub-Area.

Applications, quoting ER and naming two referees, to East Sussex and South West Kent Manager, SEEBORD, Westlords, Willingdon Road, Eastbourne, by 6th November, 1961.

GEORGE WRAY,
 Secretary.

2746

Eastern Electricity
Northmet Sub-Area

THIRD ASSISTANT ENGINEER, HORNSEY DISTRICT (Ref. 1026). Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class G, Grade 9 (£965-£1,090) plus London allowance.

Apply by letter to C. Bradley, Esq., M.I.E.E., Manager, Eastern Electricity Board, The Broadway, Crouch End, London, N.8, by 6th November, 1961.

2741

YORKSHIRE ELECTRICITY BOARD

Head Office

SECOND ASSISTANT ENGINEER
(System Design).

Applicants should have considerable experience in the planning, construction and operation of distribution systems working at 11 kV and lower voltages in urban and rural areas. Experience of 66-kV, 33-kV or lower voltage systems supplying heavy industrial loads is desirable.

Salary N.J.B. Class K, Grade 5 (transitional to Scale 14), £1,415/£1,720 per annum.

Applications, together with the names of two referees, should be sent to the Secretary, Yorkshire Electricity Board, Wetherby Rd., Scarcroft, Leeds, not later than 10th November, 1961.

No. 1 (Bradford) Sub-Area

THIRD ASSISTANT ENGINEER
(Operation and Maintenance),
2 posts.

Applicants should be fully experienced in the operation and maintenance of overhead and underground transmission and distribution systems, operating at voltages up to 66 kV, substation plant and ancillary equipment. The successful applicant will be required to perform standby duties.

Salary N.J.B. Class L, Grade 10 (Scale 10), £1,190/£1,325 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45/53, Sunbridge Rd., Bradford, 1, not later than 10th November, 1961.

No. 2 (Huddersfield) Sub-Area

THIRD ASSISTANT ENGINEER
(Distribution Design).

Applicants should have had experience in the design, construction and operation of H.V. and M.V. underground and overhead distribution systems, and should be capable of preparing schemes for extending the various distribution systems, together with the necessary technical reports and estimates.

Salary N.J.B. Class L, Grade 10 (Scale 10), £1,190/£1,325 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, not later than 10th November, 1961.

No. 3 (Sheffield) Sub-Area

SHEFFIELD CENTRAL DISTRICT

THIRD ASSISTANT DISTRICT
ENGINEER.

Applicants should have experience in the work of a District engineering department, including construction, operation, maintenance and planning.

Salary N.J.B. Class H, Grade 9 (Scale 8), £1,040/£1,165 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Change Alley, Sheffield, not later than 10th November, 1961.

No. 7 (Grimsby) Sub-Area

GAINSBOROUGH DISTRICT

DEMONSTRATOR.

Applicants must have had experience in the demonstration of electrical appliances, and be capable of advising consumers on any matter relating to the use of electricity in the home.

They must have had experience in cooking practice and general duties in the showroom. Preference will be given to applicants holding certificates of a recognised domestic training

college, Housecraft Advisers' Diploma, Certificate of the Electrical Association for Women, or equivalent qualifications.

Salary N.J.C. Grade 1, £600/£25/£700 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 10th November, 1961.

2755

COUNTY BOROUGH OF SOUTHAMPTON

TEMPORARY CLERK OF WORKS (Electrical) required in connection with the Council's extensive housing programme.

Present salary £16 19s. per week. Superannuable post.

Applicants should have served an indentured apprenticeship in the electrical contracting industry and should have a good knowledge of all types of installations and I.E.E. regulations. Experience in a similar position and knowledge of underfloor heating systems an advantage.

Applications on forms obtainable from the Borough Engineer and Surveyor, Civic Centre, Southampton, returnable by Monday, 6th November, 1961.

2718

MERSEYSIDE AND NORTH WALES
ELECTRICITY BOARD

SENIOR SERVICE CENTRE ASSISTANT required at the Board's new Service Centre located at Knutsford in the Northwich District of the Board's No. 2 Sub-Area. Salary within range £700/£775 per annum (N.J.C. Grade 2).

The successful applicant will take charge of the new Service Centre, but may be required to assist in other Service Centres in the Northwich District as and when necessary.

Applicants should have received a sound training on the commercial side of an electricity undertaking or in the electrical retail trade. A wide knowledge of modern electrical appliances is essential, and possession of the E.D.A. Sales Certificate or similar qualification would be an advantage.

Duties will include the supervision and control of Service Centre staff, display and window dressing, receipt of cash and hire purchase and credit sales.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, Northwich, Cheshire. Closing date 10th November, 1961.

2711

ASSISTANT CHIEF ELECTRICAL ENGINEER

Applications are invited for the position of ASSISTANT CHIEF ELECTRICAL ENGINEER, responsible to the Chief Electrical Engineer for the co-ordination of the operation and maintenance of London Transport's electric power supply and distribution system, supplying a peak railway load of the order of 200 MW.

Applicants should have a thorough and practical knowledge of power generation, distribution and conversion, and experience in dealing with staff. They should also be capable of conducting negotiations with staff representatives concerning conditions of service. As the electric power supply system is in process of modernisation, with an extensive programme for the replacement of plant and equipment, high technical attributes will be required.

The commencing salary will be based on the qualifications and experience of the selected candidate, within the range of £2,700-£3,600 per annum. Applicants should be not more than 50 years of age, and be Corporate Members of the Institution of Electrical Engineers.

Certain free travel facilities; contributory superannuation scheme.

Applications stating age, qualifications, present salary and giving full details of experience should be sent to:-

Chief Establishment Officer (FV/O.47/6)
London Transport Executive, 55 Broadway, S.W.1

2738

CENTRAL ELECTRICITY
GENERATING BOARD

West Midlands Division

ASSISTANT ENGINEER (Operation) is required at Drakelow "A" Power Station, near Burton-on-Trent, Staffs. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade J.10, £1,040-£1,165 per annum, plus 10% for shift duties.

Applicants should have received a sound technical training and practical experience in the operation of steam generating plant and main switchgear, and a knowledge of P.F. firing is desirable. Appropriate technical qualifications would be an advantage.

Apply, quoting Vacancy No. 235/61 MR, on form AE6, available from the Station Superintendent, Drakelow Power Station, Nr. Burton-on-Trent, Staffs., by 6th November, 1961.

2722

CENTRAL ELECTRICITY
GENERATING BOARD

West Midlands Division

APPLICATIONS are invited for the position of ASSISTANT SHIFT CHARGE ENGINEER at Drakelow "A" Power Station, near Burton-on-Trent, Staffs. Salary will be in accordance with N.J.B. service conditions, Grade J.8, £1,190-£1,325 per annum, plus 10% for shift duties.

Applicants should possess a Higher National Certificate or equivalent qualifications and have received sound technical and practical experience in a modern power station. Experience of pulverised fuel firing would be an advantage.

Apply, quoting Vacancy No. 236/61 MR, on form AE6, available from the Station Superintendent, Drakelow Power Station, Nr. Burton-on-Trent, Staffs. Closing date for receipt of applications 6th November, 1961.

2723

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

Western Division

GENERAL ASSISTANT ENGINEER (Chemist) (W/AV/103/61) required at Hayle Generating Station, Cornwall.

Superannuation scheme. Salary N.J.B. Class F, Grade 12, Scale 4, £715-£805 p.a.

Applicants should preferably possess the H.N.C. in Chemistry and should have had experience of the basic chemical services for a steam power station relating mainly to fuel sampling and analysis, water treatment and boiler water control for a medium-pressure plant.

Applications on form A.E.6/ACT, obtainable from the Regional Personnel Department, 26, Oakfield Road, Bristol, 8; should be completed and returned by 8th November, 1961.

THIRD ASSISTANT ENGINEER (W/104/61) required in the Measurements Section of the Divisional Electrical Dept.

Superannuation scheme. Salary N.J.B. Class K, Grade 8, Scale 11, £1,145-£1,410 p.a.

Candidates must have experience in testing precision power metering equipment including V.T.s and C.T.s, various types of summation equipment and instruments, in the laboratory and on site. A knowledge of electronic instruments would be an advantage.

The successful applicant will be required to drive a car.

Applicants should preferably possess qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Applications on form A.E.6/ACT, obtainable from the Personnel Department, 26, Oakfield Road, Bristol, 8, should be completed and returned by 6th November, 1961.

ASSISTANT SHIFT CHARGE ENGINEER (W/105/61) required at Plymouth "B" Power Station.

Superannuation scheme. Salary N.J.B. Class J, Grade 8, Scale 10, £1,190-£1,325 p.a. plus 10% shift allowance.

Applicants should possess good technical qualifications and have had training and experience in the control and operation of modern steam generating plant and main switchgear.

Applications on form A.E.6/ACT, obtainable from the Personnel Department, 26, Oakfield Road, Bristol, 8, should be completed and returned by 7th November, 1961.

2754

THE INSTITUTION OF ELECTRICAL ENGINEERS

EDITORIAL VACANCY

AN EDITORIAL ASSISTANT is required for the PROCEEDINGS of the Institution. Ability to edit high-class technical copy essential and some engineering experience. Candidates should be approx. 25-30 years and preferably have an engineering or science degree, or equivalent qualification.

Commencing salary of the order of £1,000 p.a. plus or minus an amount to be determined according to qualifications and experience. Five-day week; pension scheme; staff restaurant.

Apply:-

The Secretary

THE INSTITUTION OF ELECTRICAL ENGINEERS
Savoy Place, London, W.C.2

2743

You'll find room to expand with
ENGLISH ELECTRIC

FRACTIONAL HORSE-POWER MOTOR DIVISION

SENIOR DESIGN AND DEVELOPMENT ENGINEERS

As a result of the expanding field of application of F.H.P. motors, The English Electric Company are about to make senior appointments to their Design and Development Department.

ENGLISH ELECTRIC

Please reply to Tech. Staff Officer,
Dept. G.P.S., English Electric
House, Strand, London, W.C.2.

2706

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

Regional Electrical Department

APPLICATIONS are invited for the positions of three FOURTH ASSISTANT ENGINEERS (Measurements) in the Technical Branch of the Regional Electrical Department as follows:-

(a) One Engineer to be based at Newcastle upon Tyne to assist in site maintenance and testing of electrical measuring apparatus.

The appointment will be made at National Joint Board, Grade 10 in the Regional Classification, Class K (£980-£1,245 per annum).

(b) Two Engineers to be based at Leeds to assist in maintenance and testing of electrical measuring apparatus in the Regional Testing Laboratory.

The appointments will be made at National Joint Board, Grade 11 in the Regional Classification, Class K (£900-£1,165 per annum).

Applicants should preferably have had experience in the testing and calibration of precision polyphase and summation metering equipments associated with H.V. bulk supplies, indicating instruments and laboratory standardisation, and possess a Higher National Certificate in Electrical Engineering or its equivalent.

Applications stating the post applied for should be made on form AE.6, obtainable from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 8th November, 1961.

2717

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following positions:-

GENERAL ASSISTANT DISTRICT ENGINEERS (Drawing Office) (2), Bristol.

Salary within Class K, Grade 13, Salary Scale 6 (£890 to £1,015 per annum) of the N.J.B. Agreement.

Applicants should have experience in a distribution drawing office and be able to undertake, under supervision, duties which include estimating distribution schemes and preparation of associated drawings, and system networks and diagrams.

Candidates must possess the Ordinary National Certificate in Electrical Engineering.

Applications to be made on standard form AE.6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, Electricity House, Colston Avenue, Bristol. Closing date for receipt of completed applications is 11th November, 1961.

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SENIOR ASSISTANT ENGINEER (Planning) required in the Board's No. 4 Sub-Area. Salary within range £1,795-£1,950 per annum N.J.B. L.4, Scale 16.

Applicants should possess sufficient technical qualifications to enable them to become chartered electrical engineers, and have an extensive knowledge of distribution systems at all voltages and a good understanding of the associated economic factors.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhosyllen, near Wrexham. Closing date 10th November, 1961.

2745

2747

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

Electrical Engineer's Department

A THIRD ASSISTANT ENGINEER is required in the Plant Design and Investigations Section of the Technical Branch based on Leeds.

The section is concerned with design problems relating to the major electrical plant items in power stations and on the transmission system and the investigation of faults and breakdowns, including the preparation of reports.

Candidates should have had manufacturing, operating or design experience in the generation or transmission field and technical qualifications leading to Corporate Membership of the I.E.E.

The salary for this appointment will be in accordance with the National Joint Board Agreement, Grade 8, Class K (£1,145-£1,410 per annum).

Forms of application may be obtained from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 10th November, 1961.

2769

COUNTY OF LANARK

TECHNICAL ASSISTANT required for Lighting Section of County Roads Department, Hamilton.

Salary scale £715-£785 with placing according to qualification and experience. A superannuation scheme applies and a five-day week is in operation.

Candidates should have passed Higher National Certificate in Electrical Engineering or Intermediate Examination of City and Guilds in Illuminating Engineering and have experience in preparing working drawings and plans, and preferably relating to street lighting installations.

Applications stating age, qualifications and experience should be sent to the undersigned.

IAN V. PATERSON,
County Clerk.

P.O. Box No. 1, Glasgow.

2751

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

Croydon "B" Power Station

GENERAL ASSISTANT ENGINEER (Relief) (Vacancy No. 267/61). Applicants should have at least O.N.C. and should preferably have had experience of power station operation.

Salary N.J.B. Class J, Grade 14, £815 to £920 per annum, with a shift allowance at the rate of £90 per annum when applicable.

2740

ASSISTANT ELECTRICAL ENGINEER

in consulting engineers' London office. Design drawing, supervision of electrical installations in schools, hospitals, factories, etc.

5-day week, superannuation, salary range £800-£1,000 p.a.

Apply in writing to R. W. Gregory & Partners, 42, Kingsway, London, W.C.2.

2658

DORMAN & SMITH LTD.

require

TECHNICAL SALES
REPRESENTATIVES

SUCCESSFUL applicants will be of H.N.C. standard and have had some experience of selling low and medium-voltage electrical distribution gear. The work will provide an opportunity of taking an active part in the development of comparatively new electrical distribution practice in the U.K.

Apply to:—

The Secretary

DORMAN & SMITH LTD.
Atherton Works, Preston, Lancs

2558

WELSH COLLEGE OF ADVANCED TECHNOLOGY

Department of Electrical Engineering

APPLICATIONS are invited for the post of ASSISTANT LECTURER (GRADE B), mainly for teaching work in Diploma in Technology and Higher National Diploma Courses.

Salary £700 x £27 10s. to £1,150 per annum with additions for approved qualifications, training and experience.

Applicants should possess a university degree and industrial experience.

Further particulars and forms of application may be obtained from the Registrar at the College, Cathays Park, Cardiff, to whom they should be returned not later than 10th November, 1961.

ROBERT E. PRESSWOOD,
Clerk to the Governors.

2696

Eastern Electricity

Northmet Sub-Area

Senior Assistant, Estates and Wayleaves Section,
Secretarial Officer's Department
(Ref. 1090)

THE duties will include negotiations for the acquisition of substation sites up to 33 kV, obtaining wayleaves and dealing with agricultural and other damage claims for compensation.

Salary N.J.C. Grade 4 (£934 10s. to £1,060 per annum) inclusive of London allowance.

Apply by letter, giving age, education, qualifications, experience and details of present and previous appointments, to the Manager, Eastern Electricity Board, Northmet Sub-Area, Northmet House, Southgate, London, N.14, by 6th November, 1961.

2757

NORTH EASTERN ELECTRICITY BOARD

Chief Engineer's Department

APPLICATIONS are invited from suitably qualified engineers for the appointment of FOURTH ASSISTANT ENGINEER, Plant Repairs Sub-Section, with location at Carville, Wallsend. Applicants should preferably have had some experience in the repair and maintenance of electrical plant on the Board's system with emphasis on transformers and switchgear and will be required to undertake standby duty.

Salary Class K, Grade 10, £980-£1,245 per annum. Conditions of service in accordance with N.J.B. Agreement.

Applications in writing, stating age, qualifications and experience, to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, 1, within ten days of the appearance of this advertisement.

2750

MIDDLESEX COUNTY COUNCIL EDUCATION COMMITTEE

Harrow Technical College,
Northwick Park, Watford Road, Harrow
Principal: H. J. E. Anscombe, B.Sc.(Eng.),
M.I.E.E., A.M.I.Mech.E.

REQUIRED for January, 1962:—

Department of Engineering

ASSISTANT GRADE B
for Electrical Technicians and O.N.C. Courses.

Salary (at present) £738-£1,201 per annum. Additions may be given for industrial experience (up to £330 above the minimum), training and study (up to £120 above the maximum), qualifications (£165 above the maximum).

Application forms from the Principal (foolscap s.a.c.), to be returned within 14 days of the appearance of this advertisement.

C. E. GURR, M.Sc., Ph.D.,
Chief Education Officer.

2749

NORTH WESTERN ELECTRICITY BOARD

Second Assistant District Commercial Engineer
(Technical Sales and Service)
South-West District, Altrincham

APPLICANTS should be capable of handling enquiries on industrial and commercial tariff matters and giving electro-technical advice to industrial and commercial consumers on the most economical and efficient utilisation of electricity. Preference will be given to applicants who hold the H.N.C. in Electrical Engineering.

Salary scale £1,350-£1,500 p.a., Grade K.7. N.J.B. conditions.

Applications on forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, 2, P.O. Box 493, and returned to him by 6th November, 1961.

2726

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

SHIFT CHARGE ENGINEER is required at Drakelow "B" Power Station, Staffs. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade 16, £1,535-£1,720 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear in a large modern power station are required, also a knowledge of P.F. firing. The station is one of advanced design. Appropriate qualifications an advantage.

Apply, quoting Vacancy No. 234/61 MR, on form AE6, available from the Station Superintendent, Drakelow Power Station, Nr. Burton-on-Trent, Staffs., by 6th November, 1961.

2721

INSPECTING ENGINEER

required by Consulting Engineers to be based on their Manchester (Didsbury) office, but candidates must be willing to spend periods of service elsewhere in the U.K. and abroad.

Applicants should have had a sound electrical engineering training with subsequent experience mainly in the switchgear field. They must also possess at least Graduate Membership of the I.E.E.

Salary and prospects would be commensurate with the character of the appointment.

Application forms are obtainable from Staff Appointments, Kennedy & Donkin, 813a, Wilmslow Road, Manchester, 20.

2629

Situations Vacant (continued)

CENTRAL ELECTRICITY
GENERATING BOARD

West Midlands Division

ASSISTANT ENGINEER (Relief) is required at Walsall Power Station, N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade J.12, £890-£1,015 per annum.

The successful applicant will be expected to carry out shift relief duties to the Control Engineers and when not so employed will be available to undertake duties in the maintenance and operation departments. Shift allowance as laid down in the N.J.B. Agreement will be paid when shift duties are worked.

Applicants should have received a sound technical training and appropriate qualifications will be an advantage.

Apply, quoting Vacancy No. 240/61 MR, on form AE6, available from the Station Superintendent, Walsall Power Station, Reedswold Lane, Walsall, Staffs., to whom they should be returned when completed not later than 6th November, 1961.

2770

SOUTH OF SCOTLAND
ELECTRICITY BOARD

Stirling Area

Third Assistant District Engineer
(Ref. 57/61)

A VACANCY is available for a THIRD ASSISTANT DISTRICT ENGINEER in the Stirling District of the Area based on the town of Stirling.

Applicants should preferably have experience of electricity supply work and possess, as a minimum technical qualification, a Higher National Certificate in Electrical Engineering, or the equivalent.

The salary for the post, which is superannuable, will be within Class F, Grade 9 (Scale 6) of the N.J.B. Agreement (£890/£1,015 per annum).

Applications, on the standard form obtainable from the Area Manager, are to be sent to him at Woodlands, St. Ninians Road, Stirling, not later than two weeks following the publication of this advertisement.

2761

SOUTH OF SCOTLAND
ELECTRICITY BOARD

Dumfries and Galloway Area

District Commercial Assistant, Dumfries District

APPLICATIONS are invited for the post of DISTRICT COMMERCIAL ASSISTANT based at Dumfries.

Applicants should be over 21, have a good general education and be able to advise consumers on the supply tariffs, the use of domestic and small commercial, agricultural and horticultural equipment. The successful applicant will be required to supervise service centres and arrange window displays, exhibitions and demonstrations. A knowledge of the electrical industry will be an advantage.

The post is superannuable and the salary is £780/£880 per annum.

Applications, stating age and experience, should be submitted to the Manager, S.S.E.B., Marchmont, Dumfries, not later than 3rd November, 1961.

2735

A REPRESENTATIVE is required by a company manufacturing small electro-mechanisms, to cover London and the South Eastern area. Applications are invited from experienced men, with an electrical engineering background, within the age group 25/35 years. Write—Box 9599, Frost-Smith Advg., 64, Finsbury Pavement, London, E.C.2.

2771

Eastern Electricity

Norfolk Sub-Area

GREAT YARMOUTH DISTRICT

JOINTER (E.H.T.). Applicants should be capable of jointing and connecting all classes of cable, including extra high tension. The person appointed will be required to work anywhere within the boundaries covered by the Great Yarmouth District.

Rate of pay at present 5s. 6d. per hour for a forty-two-hour five-day week, and conditions of service will be in accordance with the N.J.I.C. Agreement for the Electricity Supply Industry.

Apply by letter to the Manager, Great Yarmouth District, Eastern Electricity Board, Electric House, Regent Road, Great Yarmouth, by the 6th November, 1961.

2742

CENTRAL ELECTRICITY
GENERATING BOARD

West Midlands Division

SHIFT CHARGE ENGINEER required at Coventry Power Station, Coventry. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade G.7, £1,115-£1,245 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear are required. Appropriate qualifications desirable.

Apply, quoting Vacancy No. 233/61 MR, on form AE6, available from the Station Superintendent, Coventry Power Station, Aldermans Green, Coventry, by 6th November, 1961.

2720

A N experienced armature winder, also an electrical tester, is required by Max Arc Ltd., of Walton-on-Thames, Surrey. Congenial atmosphere. Good prospects for the right person.

176

APPLICATIONS are invited for the position of manager within an illuminating company dealing with the manufacture of festive and industrial cable lighting. Rapid expansion has been made in both home and export markets. The successful candidate should preferably possess H.N.C. (Electrical) and hold membership with the Illuminating Engineering Society. He should also have the ability to design decorative lighting schemes and have experience in electrical accessory and contracting fields. Apply giving full details of age, education and experience to the Personnel Office, D.R. Illuminations Limited, Warren Street, Stockport, Cheshire.

2730

A SSISTANT diesel electric mechanic, South Georgia, required by Falkland Islands Government for service in South Georgia for one tour of 2½ years in first instance. Salary £540 a year. Gratuity at rate of £10 for each completed month of residential service. The officer will be provided with free furnished accommodation and with free fuel and lighting. Meals will also be free. Free passages. Liberal leave on full salary. Candidates, single and under 40 years of age, must be able to repair and maintain diesel electric (A.C.) generators up to 75 kW and service electrical equipment. Apply to Crown Agents, 4, Millbank, London, S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience, and quoting reference M2A/51446/EF.

2701

A SSISTANT draughtsman or improver wanted in office close to Victoria Station, London. Electrical experience an advantage. Part-time worker would be considered. Good opportunity for right man. — Phone VICToria 2266.

2660

CLERK of works for mechanical and electrical engineering services installations contracts at Seaton Barracks, Crownhill, Plymouth. The appointment will be for a period of approximately 20 months from April, 1962. Forms of application available from Hoare, Lee & Partners, Consulting Engineers, 5, Headland Park, Plymouth.

2763

COMMERCIAL assistant to managing director of small industrial electrical contractors (London) required to take charge of office. Previous equivalent experience an advantage. Details to—Box 8361.

ELECTRICAL engineer, fully qualified, required for a consulting engineer's office situated in Sidcup, Kent. Preference will be given to applicant having had previous experience with consulting engineer's requirements, and will be required to organise and develop the electrical section with a view to considering the undertaking on a partnership basis for the electrical section of our organisation, if found satisfactory. Please write giving full details of experience and salary required.—Box 8364.

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ELECTRICAL fitter required by Metropolitan Water Board at Ashford Common Works, Sunbury-on-Thames. Housing accommodation available at a reasonable rent. Wages £12 11s. 1d. for 42-hour 5-day week. Appointment to pensionable staff optional to suitable candidate after twelve months' service. Written applications from indentured men only, stating age, present position and full details of experience, should be addressed to Resident Mechanical Engineer, M.W.B. Works, Upper Sunbury Road, Hampton, Middlesex. Canvassing disqualifies and relationship to any member, officer or employee must be disclosed.—S. D. Askew, Clerk of the Board.

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INTERMEDIATE electrical draughtsman required for work on automatic control systems and production details of electrical controls, for chemical engineering firm in W.4 district, London. Salary commensurate with experience. Write details experience and age to—Box 2731.

REPRESENTATIVE required by established East London wholesaler to cover the East London area, preferably with contacts. Salary, commission and car allowance, pension scheme. Apply—Finch Wholesale Electric Ltd., 550, Ley Street, Ilford, Essex.

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SENIOR estimator required for manufacturers and installers of automatic controls for heating and ventilating. Previous experience desirable but broad engineering background essential. Excellent prospects of promotion. Write, phone or call—Mr. Sykes, Thermo-control Installations Co. Ltd., 2, Valentine Place, Blackfriars Road, London, S.E.1 (WATERloo 7356).

2709

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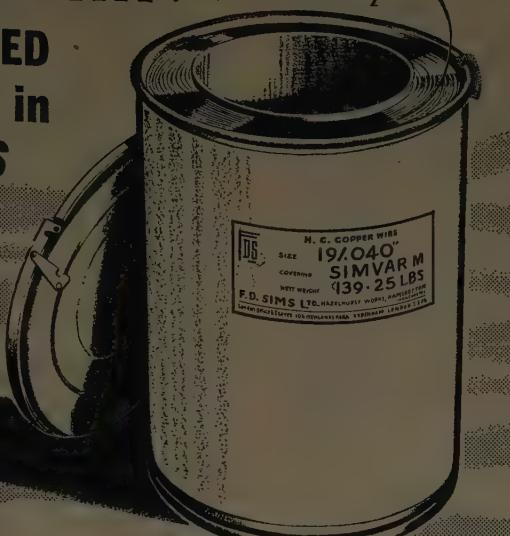
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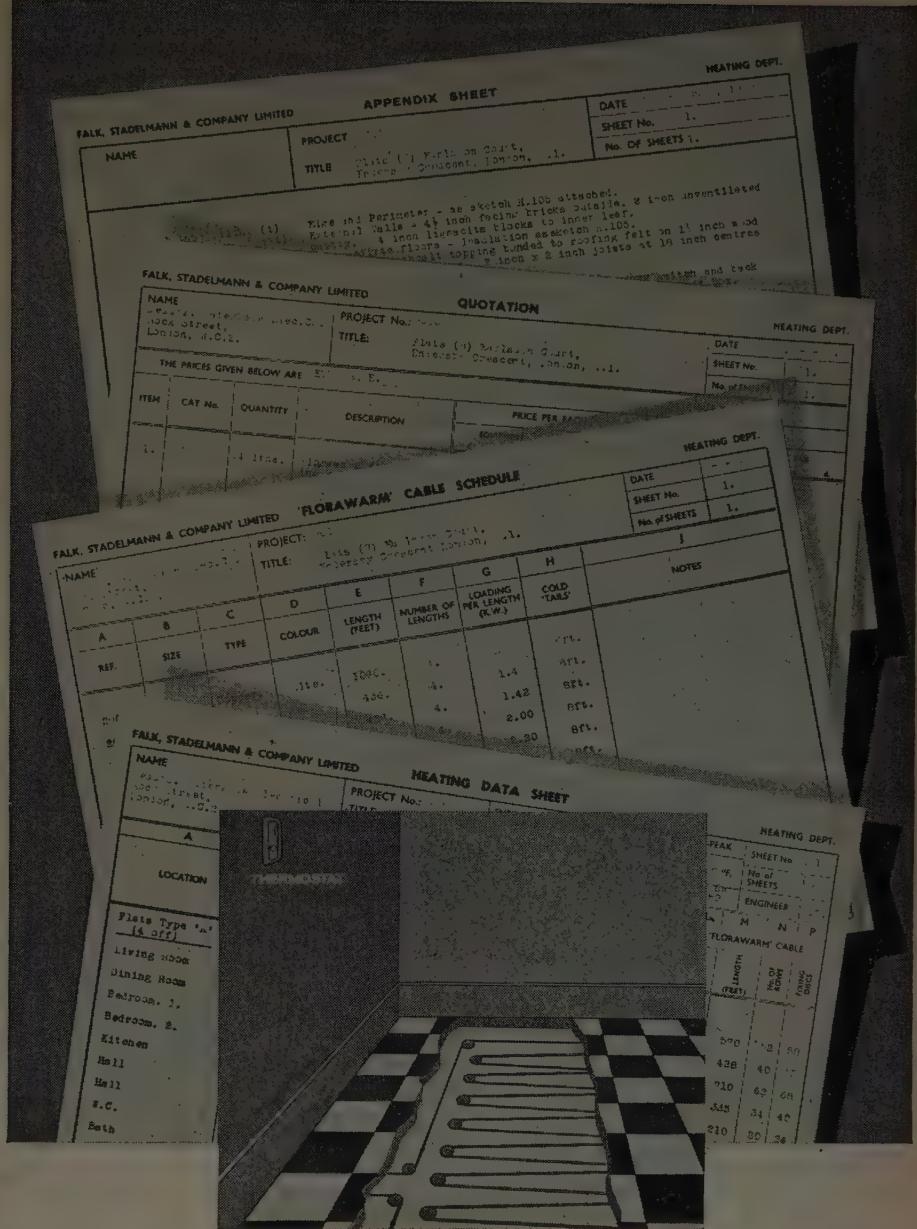
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COOKERS

ELECTRICAL REVIEW

27 OCTOBER
1961



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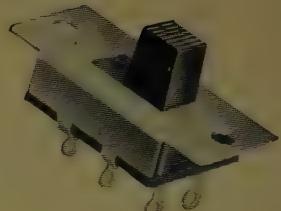
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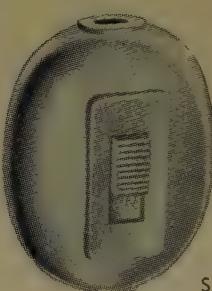
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New style spade dolly.

S.260 : All insulated 15-amp. Switch.

C.S.200 : 15-amp. 4 Position Rotary Switch,
Double pole 3-heat control for cookers.

S.952 : Miniature Line Cord Switch.

S.960 : Spin Dryer Switch.



S.952



S.260



S.L.50



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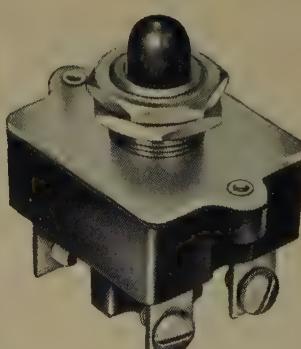
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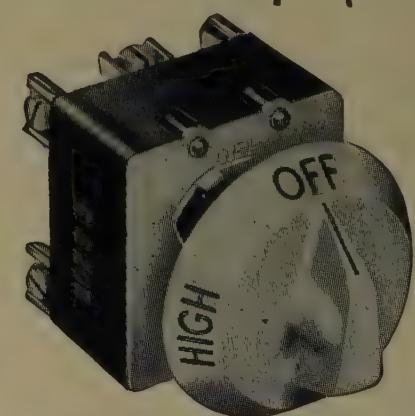
G.605



A.56



S.960



C.S.200

ELECTRIC COOKERS

The number of electric cookers at present in use in the homes in this country is now greater than at any other time—recent estimates place the figure as high as five million—and there is a growing preference for this form of cooking.

During the past ten years or so the ratio of production of electric cookers to that of their gas counterparts has been steadily rising. In 1952 four gas cookers were produced for every one electric cooker, whereas in January-June, 1961, the ratio was 1 (gas) to 1.12 (electric). Last year manufacturers' deliveries to the home market reached 510,000, the highest of any year so far. In fact, the annual production of electric cookers was virtually doubled between 1948 and 1960 and there are now four times as many in use as in pre-war years.

There has been a tendency in recent years for more electric cookers to be sold through normal retail outlets (large stores rather than the electrical dealer), although the Electricity Boards still command the major share of the market. It is, however, of interest to note that during the first six months of this year sales by the Electricity Boards had fallen from 71.9 of the total to 69.9 per cent, while those by wholesalers and contractors had risen from 23.3 to 26.4 per cent. The District organisations of the Area Boards are, however, singularly suited to the sale of electric cookers. Facilities

for dealing with the whole operation are available, including an installation department which takes care of the delivery and fixing of the cooker and also the responsibility for after-sales service and maintenance.

There has been a rise in the demand for all-white cookers—latest figures indicate that 62.2 per cent of the total are of this colour as compared with 35.2 per cent with an all-cream finish. The preference for radiant as against the old type solid hotplates continues to grow and the number of two-plate cookers represented only 1.4 per cent of the total in June, 1961, while, at the same time, the proportion of cookers with four or more plates rose from 29.85 to 43 per cent of the total sales.

One desirable improvement which was emphasised at a recent meeting of representatives of the Electric Cooker Section of the British Electrical and Allied Manufacturers' Association was the need for larger kitchens to accommodate the many electrical appliances on the market, including electric cookers. It was agreed that more space was needed to permit the installation of "built-in" cookers (self-contained ovens and hotplate units) which many housewives might possibly prefer. It was stated that this was a matter in which housing authorities, architects and builders needed "education."

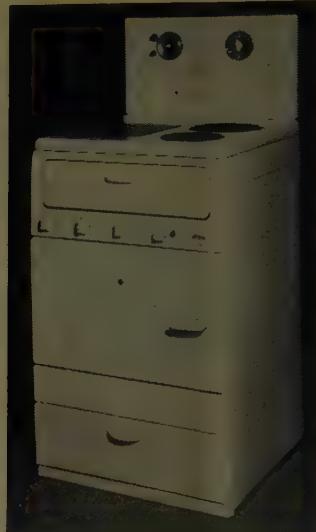
Manufacturer or Distributor	Name or Model	Size (inches)	Oven Size (inches) and Loading	Boiling Plates and Grill	Special Features	Finish	Price
ALLIED IRON-FOUNDERS, LTD., Electrical Appliance Division, 28, Brook Street, London, W.1.	" Falco Royalty "	57 x 23 x 23½	16½ x 17½ x 17 — 2,500 W	Two 2.2 kW 8in radiant Two 1.4 kW 6½in radiant 2 kW grill	Auto-timer, convector oven, glass door, oven light, plate rack, heated drawer	White, cream or pastel blue	£59 10 0
	" Moray "	42 x 20 x 22	14 x 14 x 14½ — 2,500 W	One 2 kW 8in radiant (plus one 1 kW 6½in solid on 3-plate model) 2 kW grill boiler	Storage drawer £2 extra, glass door £1 3s 6d extra	White, cream or pastel blue	£32 11 3 (3-plate) £31 13 3 (2-plate)
BELLING & CO., LTD., Southbury Road, Enfield, Middlesex. (continued on next page)	47AB and 47T	44 and 49½ x 21 x 22½	16 x 13 x 13 — 2,500 W	One 2 kW 8in radiant One 1 kW 6½in solid 2.3 kW grill boiler	Storage drawer, inner glass door (47T has clock timer)	Cream or white, coloured hobs	£37 15 0 (47AB) £45 0 0 (47T)
	48AB and 48T	54 x 21 x 22½	16 x 15 x 13 — 3,000 W	One 2 kW 8in radiant One 1 kW 6½in solid 2.3 kW grill boiler	Storage drawer, inner glass door, oven light (48T has clock timer)	Cream or white, coloured hobs	£45 15 0 (48AB) £51 0 0 (48T)
	45A "Baby Belling"	21 x 18 x 15½	11½ x 13 x 13 — 1,200 W	2 kW grill boiler	Hot cupboard, available on stand (£2 7 6 extra) or cabinet (£4 15 extra)	Cream or white	£16 0 0



1. Allied Ironfounders "Moray" 3-plate cooker

2. Belling "Classic 70" cooker





3

3. Allied Ironfounders "Falco Royalty" 4-plate cooker
 4. Belling "Classic 60" cooker with hob light
 5. Carron model L.75 cooker with hot cupboard door

Manufacturer or Distributor	Name or Model	Size (inches)	Oven Size (inches) and Loading	Boiling Plates and Grill	Special Features	Finish	Price
BELLING & CO., LTD., Southbury Road, Enfield, Middlesex. (continued)	51 "Wee Baby" Belling	12 x 13½ x 11½	9½ x 9 x 9½ — 600 W	1.5 kW grill boiler	—	Cream or white	£8 12 0
	51H "Twin Baby" Belling	12 x 21 x 13	9½ x 9 x 9½ — 600 W	One 1 kW 6½in solid 1.5 kW grill boiler	Hot cupboard stand (£2 5 extra)	Cream or white	£15 15 0
	52 "Baby" Belling	14 x 17 x 16	11½ x 11½ x 11½ — 1,000 W	2 kW grill boiler	Stand (£2 5 extra)	Cream or white	£13 15 0
	53 "Big Baby" Belling	36 x 21 x 16	11½ x 11½ x 11½ — 1,000 W	One 1.8 kW 8in solid 2 kW grill boiler	Hot cupboard, switch interlock limits load to 3 kW	Cream or white	£21 7 6 (on stand) £23 10 0 (on cabinet)
	29	9½ x 16½ x 12	—	2.3 kW grill boiler	Hot cupboard	Cream or white	£7 19 6 (3-heat) £8 15 0 ("Simmer-stat")
	"Classic" 60	54 x 21 x 24	16 x 15 x 15 — 3,000 W	Four 2.1 kW 7in radiant 2,500 W grill	Heated hot cupboard, hob light, oven light, inner glass door, clock-timer	Cream or white, coloured hobs	£69 10 0
	"Classic" 70	54 x 42 x 24	16 x 15 x 15 — 3,000 W	Four 2.1 kW 7in radiant 2,500 W grill	As "Classic" 60 plus large heated hot cupboard and large utensil drawer (a) or with additional oven instead of heated hot cupboard (b)	Cream or white, coloured hobs	£105 0 0 (a) £115 0 0 (b)
CARRON CO., Carron, Falkirk, Stirlingshire.	L.75	36 x 22 x 21	12½ x 14½ x 14 — 2,400 W	One 1.8 kW 8in solid One 1 kW 6½in solid 2 kW grill boiler	Hot cupboard, door to hot cupboard (£1 5 extra)	All white or all cream	£34 19 0 (standard) £47 14 6 (auto-timer, ringer and 8in radiant plate)
	C.2	36 x 22 x 21	12½ x 14½ x 14 — 2,400 W	One 1.8 kW 8in solid 2 kW grill boiler	Hot cupboard, extra wide oven	Cream with black hob or two-tone colours	£29 3 0
	C.3	36 x 22 x 21	12½ x 14½ x 14 — 2,400 W	One 1.8 kW 8in solid One 1 kW 6½in solid 2 kW grill boiler	Hot cupboard, extra wide oven	Cream with black hob or two-tone colours	£31 17 0
	"Charmer"	36 x 21 x 24 (overall height 51in)	15½ x 15½ x 15 — 2,600 W	One 2 kW 8in radiant One 1.3 kW 6½in radiant 2 kW grill boiler	Auto-timer control and five-hour ringer to oven, inner glass door and oven light, hot cupboard bottom drawer	All white or all cream. Gold fascia panel	£55 0 0



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ideal for everyday cooking. Pre-set at an average temperature of 300°F. Is a grill and hot cupboard too! Grill has variable heat control by simmerstat.



MAIN OVEN

for full-scale cooking. Oven light and glass inner door included. Total loading of 2600 watts. Two non-tilt reversible grid shelves give total of nine different cooking positions.



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'ENGLISH ELECTRIC'
The English Electric Co. Ltd.,
Domestic Appliance Division,
London and Liverpool



Automatic control on
one hotplate keeps pans
from boiling over

ENGLISH ELECTRIC



6

6. English Electric model 2034 double-oven cooker
 7. English Electric model 2033 cooker with hob light
 8. Electro Appliances & Equipment Co.'s "Sigma" model L.201/4 cooker



7



8

Manufacturer or Distributor	Name or Model	Size (inches)	Oven Size (inches) and Loading	Boiling Plates and Grill	Special Features	Finish	Price
ELECTRO APPLIANCES & EQUIPMENT, LTD., 177, Regent Street, London, W.1.	"Sigma" L.201/4	34½ x 20½ x 23½	10½ x 13 x 19 1,800 W	One 1.5 kW 5.7-in solid One 2.1 kW 7-in solid One 1.5 kW 7-in solid One 2 kW 8.7-in solid	Automatic rotary spit, oven converts to grill, drop-down door	White	£54 12 0
ENGLISH ELECTRIC CO., LTD., English Electric House, Strand, London, W.C.2.	2032	51 x 21 x 24½	13½ x 13½ x 17½ 2,600 W	One 2.1 kW 8-in radiant One 1.25 kW 6½-in radiant 2.5 kW grill boiler	Hot cupboard, storage drawer, eye-level controls, chromium trims on hot plates, oven light, inner glass door, lipped hob	Cream or white	£42 0 0
	2033	54 x 21 x 24½	13½ x 13½ x 17½ 2,600 W	One 2.1 kW 8-in radiant One 1.25 kW 6½-in radiant 2.5 kW grill boiler	As 2032 plus shaded tubular light above hob and auto-timer control	Cream or white	£50 8 0
	2034	36 x 21 x 25½	13½ x 13½ x 17½ (Main oven) 7½ x 15½ x 17½ (Top oven) 2,600 W	Four 2 kW 7-in radiant 2 kW grill boiler	Two ovens, auto control on one hotplate, hot cupboard, storage drawer, oven light, lipped hob, glass door, auto-timer control (hob light extra)	Cream or white	£69 6 0

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Manufacturer or Distributor	Name or Model	Size (inches)	Oven Size (inches) and Loading	Boiling Plates and Grill	Special Features	Finish	Price
G.E.C. (DOMESTIC EQUIPMENT), LTD., Langley House, Hanger Lane, Ealing, London, W.5.	DC763 and DC765 "Treasure 3"	54½ x 21½ x 22½	15 x 14½ x 14½ 2,600 W	Two 2.1 kW 7in radiant One 1 kW 6½in solid 1,750 W eye-level grill	Heated storage drawer, glass door, hob sealed solid plate (auto-timer control—DC765 only)	White or honeysuckle	£44 2 0 (DC763) £47 5 0 (DC765)
	DC770 "Treasure 4"	54½ x 21½ x 22½	15 x 14½ x 14½ 2,600 W	Four 2.1 kW 7in radiant 1,750 W eye-level grill	Heated storage drawer, glass door, interior oven light, auto-timer control	White or honeysuckle	£54 12 0
	DC757GD "Quality"	43½ x 18½ x 21	13½ x 13½ x 14½ 2,425 W	One 2.35 kW 8in radiant One 1 kW 6½in solid 2 kW grill boiler	Storage drawer, glass door, gliding grill, (auto-control panel £10 15 extra)	White or honeysuckle	£35 0 0
	DC120A and DC124A "Supreme"	54 x 22 x 24	13½ x 16½ x 15½ 2,910 W	DC120A: Two 2,350 W 8in radiant One 1,300 W 6½in radiant 2 kW eye-level grill DC124A: as above plus one 1,300 W 6½in radiant	Heated storage drawer, auto-timer, mounted on castors, drop down door, glass door. * See below	White or honeysuckle, switch panel in blue, red or green	£74 0 0 (DC120A) £79 0 0 (DC124A)
	DC115 "Superb"	53 x 21½ x 24	13½ x 16½ x 15½ 2,910 W	Two 2,350 W 8in radiant 2,500 W grill boiler	Heated storage drawer, gliding grill, drop down glass door, auto-timer	White or honeysuckle	£59 10 0

* "Rotoroast" rotary spit now supplied with DC120A "Supreme" cooker at no extra cost. "Rotoroast" for existing "Supreme" cookers, price £5 8, plus £1 5 4 tax when purchased separately.

GENERAL STEEL WARES, LTD., 259, Marylebone Road, London, N.W.1.	"McClary-Easy" CE30-16	30 x 36 x 28½	25 x 16 x 18½ 3,000 W	One 2.6 kW "Sensotherm" radiant Three 1.5 kW "2 in 1" radiant 2,800 W grill	Lift out plates, electric clock, removable oven door, oven window, oven light, rotisserie, meat minder, automatic oven, "3 in 1" broiler	White, chromium trim	£147 11 0
	"McClary-Easy" DME30-16	30 x 36 x 28½	25 x 16 x 18½ 3,000 W	One 2.1 kW "Giant" radiant Three 1,250 W "2 in 1" radiant 2,800 W grill	Electric clock, removable oven door, oven window, oven light, rotisserie, automatic oven	White, chromium trim	£123 16 0
	"McClary-Easy" DE23-16	23 x 36 x 28½	20 x 16 x 18½ 2,400 W	One 1.5 kW "Sensotherm" radiant One 2,600 W "Giant" radiant Two 1.5 kW "2 in 1" radiant 2,400 W grill	Lift-out elements, electric clock, removable oven door, oven window, oven light, "3 in 1" broiler, automatic oven	White, chromium trim	£122 12 5
	"McClary-Easy" ME20-16	20 x 36 x 23½	16 x 12½ x 17½ 2,000 W	One 1.6 kW "2 in 1" radiant Three 1,250 W "2 in 1" radiant 2,200 W grill	Storage drawer, oven broiler, appliance outlet	White, chromium trim	£84 2 3



9



10



11

9. General Steel Wares "McClary-Easy" model SDE 30-16 cooker
10. G.E.C. model DC120A 3-plate cooker with eye-level grill
11. G.E.C. "Treasure 4" 4-plate cooker with eye-level grill

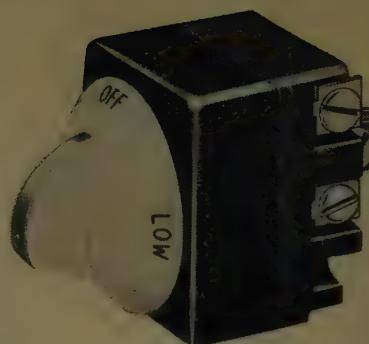
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Table giving the properties of the more important types of Telcon Thermostatic Bimetals.

Type	Strip* Deflection Constant	Electrical resistivity Microhm-cm at 20°C	Range of max. Sensitivity °C	Useful deflection Range °C	Stabilising Heat Treatment Temp. °C for one hour
140	14.0 x 10 ⁻⁶	76	20-200	-70 to 350	350
400	12.0 x 10 ⁻⁶	70	70-300	-70 to 400	350
15	9.5 x 10 ⁻⁶	17	20-120	-70 to 220	350
75	6.8 x 10 ⁻⁶	57	150-300	-70 to 500	350
38	3.8 x 10 ⁻⁶	56	20-250	-70 to 500	350
188	9.0 x 10 ⁻⁶	93	10-150	-70 to 500	350
131	13.3 x 10 ⁻⁶	18	10-120	-75 to 150	175
11	8.4 x 10 ⁻⁶	20	10-150	-70 to 350	350
200	19.9 x 10 ⁻⁶	109	10-175	-75 to 260	260



* The deflection constant (d) is defined as the deflection of a strip of unit length and unit thickness for each °C rise in temperature over the linear part of the deflection curve.

All types of Bimetal shown in the table are manufactured in strip form down to 0.005 in. thick, in widths not greater than 6 in. They can also be supplied down to 0.0025 in. thick with a maximum strip width of 3 in. Cut strips are also supplied. Materials can be suitably etched to indicate the high or low expansion sides, as requested.

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Manufacturer or Distributor	Name or Model	Size (inches)	Oven Size (inches) and Loading	Boiling Plates and Grill	Special Features	Finish	Price
HELIMATIC, LTD., 22-24, Buckingham Palace Road, London, S.W.1.	"Elektro-Helios" S.21 De-Luxe	33½×27×24	10½×13½×19 2,200 W	One 1,800 W 8·7in solid Two 1,200 W 7·1in solid One 1,500 W 5·7in solid 2,800 W grill	Heated hot cupboard, storage drawer, window in oven door, oven light	White	£70 0 0
LONOR, LTD., 1, Maddox Street, London, W.1.	"Siemens" THB.2B	12½×22½×15	7½×17×11½ 1,200 W	One 2 kW 7in solid One 1 kW 5·7in solid	Close down lid, Cabinet stand £7 11 9 extra	White	£22 7 9
MOFFATS, LTD., 37, Davies Street, London, W.1.	"Fiesta" 32F100W	25×32×26½ (60in high including base)	12×21½×15½ 1,800 W	One 2,125 W 8in radiant One 2,125 W 6in radiant Two 1,500 W 6in radiant 3 kW oven grill	Eye-level oven, glass door, chromium interior, push-button powered oven rack, oven light, removable oven base	Satin chrome, white enamelled sides	£225 0 0 £40 0 0 (base)
	40E100W	48½×40×28	Top: 15½×21×20 2,000 W Bottom: 15½×13½×20 1,750 W	Two 2,125 W 8in radiant Two 1,500 W 6in radiant One 2,125 W 8in thermostatic and time-controlled radiant 3·3 kW oven grill (top) 3 kW oven grill (bottom)	Rotary spit and "Kabob" forks, heated drawer, meat thermometer, storage drawer, illuminated control panel, deep well cooker/fryer	White vitreous enamel	£205 0 0
	30E100W	48½×30×28½	15½×24×20 2,000 W	One 2,125 W 8in radiant Two 1,500 W 6in radiant One 2,125 W 8in thermostatic and time-controlled radiant 3·3 kW oven grill	Rotary spit and "Kabob" forks, heated drawer, meat thermometer, illuminated control panel, deep well cooker/fryer	White vitreous enamel	£152 0 0
	24E100W	48½×24×28½	15½×24×20 2,500 W	One 2,125 W 8in radiant Two 1,500 W 6in radiant One 1,500 W 6in thermostatic and time-controlled radiant 3·3 kW oven grill	Rotary spit and "Kabob" forks, heated drawer, illuminated control panel	White vitreous enamel	£135 0 0
	24E37W	44½×24×28½	15½×21×20 2,500 W	One 2,125 W 8in radiant Three 1,500 W 6in radiant 3·3 kW oven grill	Rotary spit and "Kabob" forks, heated drawer, removable oven door	White	£99 10 0

Moffat "Built-in" units: Model 21E80W, oven and grill, £96 12s (vitreous enamel), £99 15s (satin chrome); Model SEE460, 4-plate surface unit, £42 (vitreous enamel), £45 (satin chrome); Model SEE260, 2-plate surface unit, £28 (vitreous enamel), £31 (satin chrome).



12



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12. Helimatic "Elektro-Helios" model S.21 de-luxe cooker
 13. Lonor "Siemens" model THB.2B miniature 2-plate cooker
 14. Moffats "Fiesta" electric cooker mounted on base



15



16



17



18



15. Moffats "built-in" oven and 4-plate surface unit

16. Jackson "Rotisserie" for use with the "Highline" cookers in place of the grill pan (Electrical Division of Radiation, Ltd.)

17. Moffats model 40E.100W cooker

18. Jackson model 494T "Highline" cooker with eye-level grill (Electrical Division of Radiation, Ltd.)

Manufacturer or Distributor	Name or Model	Size (inches)	Oven Size (inches) and Loading	Boiling Plates and Grill	Special Features	Finish	Price
RADIATION, LTD. (ELECTRICAL DIVISION), 255, North Circular Road, Neasden, N.W.10.	"Highline" 493 and 493T	50 $\frac{1}{2}$ x 21 x 24 $\frac{1}{2}$	14 $\frac{1}{2}$ x 13 $\frac{1}{2}$ x 15 $\frac{1}{2}$ 2,400 W	One 2.4 kW 7-lin V.H.S. solid Two 1.5 kW 7-lin solid "Speedrings" 2 kW eye-level grill	Heated storage drawer, spillage proof hob, oven roof protector, glass door, mobile plinth £3 extra (automatic timer 493T only)	White or cream	£49 0 0 (493) £54 0 0 (493T)
	"Highline" 494 and 494T	50 $\frac{1}{2}$ x 21 x 24 $\frac{1}{2}$	14 $\frac{1}{2}$ x 13 $\frac{1}{2}$ x 15 $\frac{1}{2}$ 2,400 W	One 2.4 kW 7-lin V.H.S. solid Three 1.5 kW 7-lin solid "Speedrings" 2 kW eye-level grill	As 493T plus interior oven light 494T as 494 plus automatic timer	White or cream	£54 15 0 (494) £59 15 0 (494T)
	"Estate" 391P 391C and 391CT	41 $\frac{1}{2}$ x 20 $\frac{1}{2}$ x 24 $\frac{1}{2}$ 47 $\frac{1}{2}$ x 20 $\frac{1}{2}$ x 24 $\frac{1}{2}$ (391CT only)	14 $\frac{1}{2}$ x 13 $\frac{1}{2}$ x 15 $\frac{1}{2}$ 2,100 W	One 2 kW 8in solid "Speedring" One 1.350 W 6 $\frac{1}{2}$ in solid "Speedring" 2,300 W grill boiler	"Speedring" plates with 6-heat switch control, storage drawer with removable tray (not 391P)	White or cream	£30 0 0 (391P) £32 0 0 (391C) £37 0 0 (391CT)
	392JO (independent oven)	21 x 21 $\frac{1}{2}$ x 22 $\frac{1}{2}$	14 $\frac{1}{2}$ x 13 $\frac{1}{2}$ x 15 $\frac{1}{2}$ 2,500 W	—	As above plus oven timer and chromium bezels (391CT only)	White or cream	£23 7 6
	69 "Giant"	16 x 18 x 18 $\frac{1}{2}$	8 $\frac{1}{2}$ x 10 x 13 $\frac{1}{2}$ 1,000 W	One 1.5 kW 7in radiant 800 W grill	Hot cupboard, stand complete with potshelf £2 extra	Cream and black, or white and black, eau-de-nil or blue	£19 10 0

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AND DEEP WELL COOKER

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Manufacturer or Distributor	Name or Model	Size (inches)	Oven Size (inches) and Loading	Boiling Plates and Grill	Special Features	Finish	Price
REVO ELECTRIC CO., LTD., Tipton, Staffs.	" Family Special "	48½×21×24	13½×14½×15 2,100 W	One 1.8 kW 8in radiant One 1 kW 6½in radiant 2.2 kW grill boiler	Hot cupboard (auto-timer, glass door, optional extras)	White or cream	£44 7 6 £48 17 6 (auto-timer, glass door)
	" Regent " 553	45×21×21½	13½×13½×14 2,100 W	One 1.8 kW 8in solid One 1 kW 6½in solid 2.2 kW grill boiler	Hot cupboard, (radiant plates, storage drawer and glass door optional extras)	White or cream	£28 0 0 (plinth) £31 10 0 (utensil drawer and glass door)
	" Peerless Major "	17½×21×15½	12½×11½×13 900 W plus 2 kW grill boiler	One 1 kW 6½in radiant 2 kW grill boiler	Hot cupboard, suitable for 13 A outlet (leg stand or cabinet base extra)	Grey and white or grey and cream	£21 2 6 £22 10 0 (leg stand) £24 10 0 (cabinet base)
	" Revomatic "	53½×23×24	14×15½×13½ 2,100 W	One 1.8 kW 8in radiant One 1.8 kW 8in solid 3 kW grill boiler	Auto-timer, hot cupboard, storage drawer, choice of coloured hobs	White or cream	£74 7 0
	" Regal "	48½×23×24	14×15½×13½ 2,100 W	Two 1.8 kW 8in solid 2.2 kW grill boiler	Hot cupboard (auto-timer and storage drawer optional extras) choice of coloured hobs	White or cream	£39 0 0
SIMPLEX ELECTRIC CO., LTD., Creda Works, Blythe Bridge, Staffs. (continued on next page)	" Creda Constellation " 317	33×40½×23½	Two ovens each 14×15×15½ each 2,500 W	Four 1.6 kW 7½in " Creda " " Quick Discs " (2.5 kW boost) Two 2,250 W grills (one in each oven)	Roasting spit, griddle, two socket outlets (one time controlled), glass doors, oven light	White or cream, stainless metal trim	£110 5 0
	" Creda Super Four " 319	33×20×23½ (3in plinth available as extra)	14×15×15½ 2,500 W	Four 1.6 kW 7½in " Creda " " Quick Discs " (2.5 kW boost) 2,250 W grill	Roasting spit, griddle, warming drawer, fluo. hob light, glass door, oven light	White or cream	£61 19 0



19



20

19. Revo "Peerless Major" on cabinet base
20. Simplex "Creda Mercury Super 4" with rotary spit
21. Simplex "Creda Constellation" double-oven cooker
22. Revo "Family Special" cooker



21



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23



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23. "Thompson Tappan" model 442 cooker (John Thompson Instrument Co.)

24. Tricity "Marquis" 4-plate cooker with rotary spit

25. Tricity "Viscount" 4-plate cooker

26. "Thompson Tappan" microwave oven (John Thompson Instrument Co.)

26



Manufacturer or Distributor	Name or Model	Size (inches)	Oven Size (inches) and Loading	Boiling Plates and Grill	Special Features	Finish	Price
SIMPLEX ELECTRIC CO., LTD., Creda Works, Blythe Bridge, Staffs. (continued)	"Creda Four" 316	33 x 20 x 23½ (3in plinth available as extra)	14 x 15 x 15½ — 2,500 W	Four 1.6 kW 7½in "Creda" "Quick Discs" (2.5 kW boost) 2,250 W grill	Warming drawer, glass door, oven light	White or cream	£55 13 0
	"Creda Super Three" 318/25	33 x 20 x 22½ (3in plinth available as extra)	14 x 15 x 15½ — 2,500 W	Three 1.6 kW 7½in "Creda" "Quick Discs" (2.5 kW boost) 2,250 W grill	Roasting spit, warming drawer, fluo. hob light, glass door, oven light	White or cream	£55 13 0
	"Creda Three" 318	33 x 20 x 22½ (3in plinth available as extra)	14 x 15 x 15½ — 2,500 W	Three 1.6 kW 7½in "Creda" "Quick Discs" (2.5 kW boost) 2,250 W grill	Warming drawer, glass door, oven light	White or cream	£51 9 0
	"Creda Mercury Plus" 315/9	33 x 20 x 22½ (3in plinth available as extra)	14 x 15 x 15½ — 2,500 W	Three 1.6 kW 7½in "Creda" "Quick Discs" (2.5 kW boost) 2,250 W grill	Warming drawer, glass door, oven light	White or cream	£43 1 0
	"Creda Mercury Standard" 315	33 x 20 x 22½ (3in plinth available as extra)	14 x 15 x 15½ — 2,500 W	Three 1.6 kW 7½in "Creda" "Quick Discs" (2.5 kW boost) 2,250 W grill	Warming drawer	White or cream	£38 17 0
	"Creda Star Gazer" 310	36 x 18½ x 23½	12½ x 13½ x 15½ — 2,200 W	One 2 kW 8in radiant One 1 kW 6½in solid 2 kW grill	Storage drawer	White or cream	£37 16 0
JOHN THOMPSON INSTRUMENT CO., LTD., Ettingshall, Wolverhampton. (continued on page 16)	"Thompson-Tappan" 442	61 x 40 x 19½	No. 1 oven: 11½ x 21½ x 15½ — 2,500 W No. 2 oven: 11½ x 12½ x 15½ — 1,750 W	Three 1,500 W 6in radiant One 2,600 W 8in radiant 3 kW oven grill	Slide-away cooking top, cutting board, roast meter, chromium oven, appliance sockets, two controlled boiling rings, rotisserie, removable oven seals, warming compartments	"Lusterloy" and stone enamelled	£248 0 0

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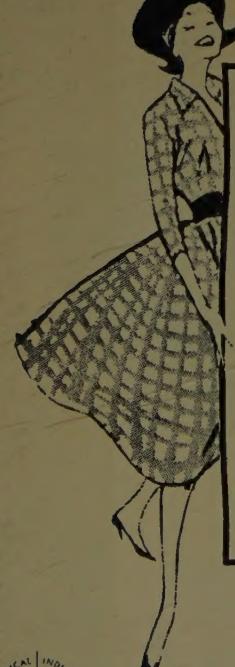
"Thank you very much for a wonderful cooker. I love it so much words fail me. Everything for me is perfect".



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"As a 'new housewife' I produced a superb spit-roasted joint on first attempt!"



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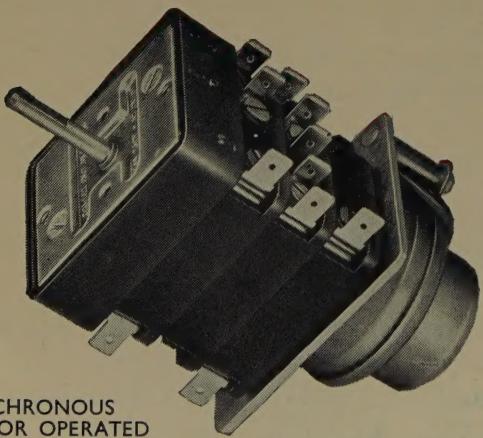
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Manufacturer or Distributor	Name or Model	Size (inches)	Oven Size (inches) and Loading	Boiling Plates and Grill	Special Features	Finish	Price
JOHN THOMPSON INSTRUMENT CO., LTD., Ettingshall, Wolverhampton. (continued)	" Thompson-Tappan " 436	61 x 30 x 19 $\frac{1}{2}$	11 $\frac{1}{2}$ x 21 $\frac{1}{2}$ x 15 $\frac{1}{2}$ 2,500 W	Three 1,500 W 6in radiant One 2,600W 8in radiant 3 kW oven grill	As Model 442, less cutting board	" Lusterloy " and stone enamelled	£190 5 0
	Microwave oven	26 $\frac{1}{2}$ x 23 $\frac{1}{2}$ x 22 $\frac{1}{2}$	19 x 19 x 16 8 kW	—	Cooks by microwave energy		£495 0 0
	B.I.L.O. 440	21 x 40 x 19 $\frac{1}{2}$	As Model 442	—	Roast meter, chromium oven, rotisserie, removable oven seals		£155 0 0
	B.I.L.O. 430	21 x 30 x 19 $\frac{1}{2}$	As Model 436	—	—		£101 0 0
	C.T.L. 440	12 x 40 x 5	—	Three 1,500 W 6in radiant One 2,600W 8in radiant	Two controlled boiling rings		£58 10 0
	C.T.L. 430	28 x 30 x 5	—	—	—		£56 0 0
TRICITY COOKERS, LTD., Thorn House, Upper St. Martin Lane, London, W.C.2.	" Popular " 528	36 x 19 $\frac{1}{2}$ x 16	10 $\frac{1}{2}$ x 11 $\frac{1}{2}$ x 12 $\frac{1}{2}$ 1,150 W	One 1 kW 6in radiant 1,800 W grill boiler	Hot cupboard, storage cabinet, selector switch enables it to be used off 13/15 A circuit	White or ivory	£26 15 0
	" Viscount " 613 Mk. III	50 $\frac{1}{2}$ x 21 x 25	15 $\frac{1}{2}$ x 15 x 15 $\frac{1}{2}$ 2,400 W	Three 2 kW 7in radiant 2,200 W grill	Hot cupboard, glass door (time switch £5 5 extra)	White or ivory Duo-tone fascia panel	£46 4 0
	" Viscount " 616 Mk. III	50 $\frac{1}{2}$ x 21 x 25	15 $\frac{1}{2}$ x 15 x 15 $\frac{1}{2}$ 2,400 W	Four 2 kW 7in radiant 2,200 W grill	Hot cupboard, glass door (time switch £5 5 extra)	White or ivory Duo-tone fascia panel	£50 8 0
	" Marquis " 614 Mk. III	52 $\frac{1}{2}$ x 21 x 25	15 $\frac{1}{2}$ x 15 x 15 $\frac{1}{2}$ 2,400 W	Four 2 kW 7in radiant 2,200 W grill	Hot cupboard, auto-timer, fluo. hob floodlight, oven light, glass door, roasting spit	White or ivory	£69 6 0

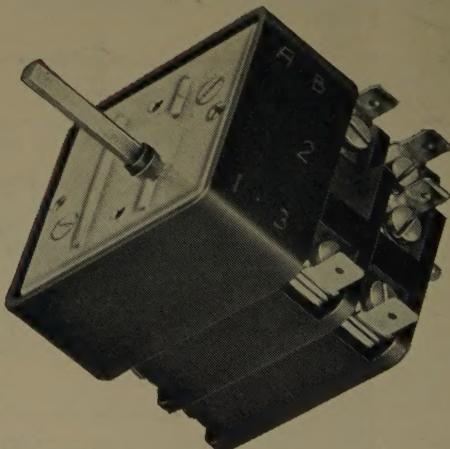
Tricity " Built-in " units: Model 690, oven and grill, £59 17s; Model 691, surface unit, £39 18s.

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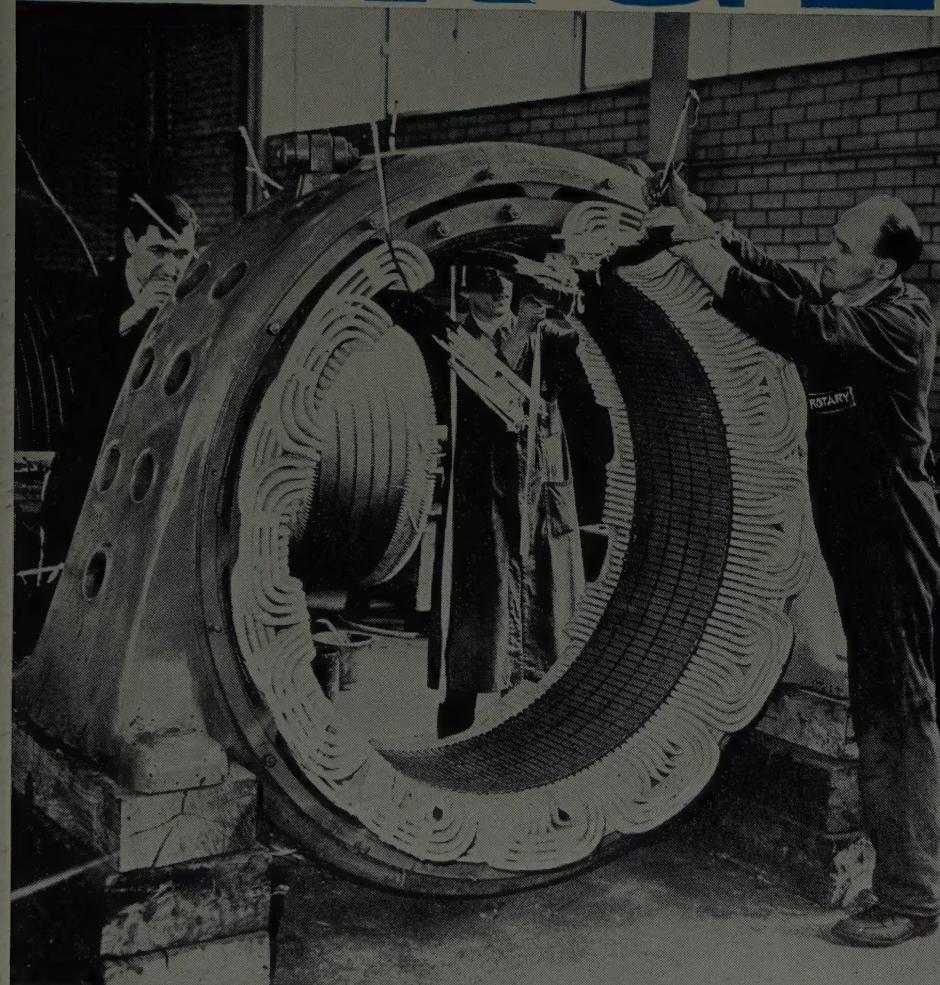
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